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THE RED-TAILED HAWK.

BY DR. W. WOOD.

This bird is generally known as the Hen-hawk (*Buteo borealis*). It is so seldom taken in this vicinity that when captured the hunters will tell you that they have killed "one of the real old-fashioned hen-hawks."

Having recently had the young of the Red-tailed Hawk brought to me as something new and rare, and as there is such a dissimilarity between the adult and the young that no one except a naturalist would recognize them as the same bird, I will give a description of the bird in its different plumage, with an account of its habits.

On the Pacific the Red-tailed Hawk is supplanted by a closely allied species (*Buteo montanus*). It is peculiar to America, and in its adult plumage is easily recognized from any of its genus. It is extremely shy, and not easily taken unless approached in a wagon or on horseback. The flight of this bird is strong and firm, often sailing to a great distance without any apparent motion of its wings. Occasionally several of them will be seen very high in the air, sailing about in circles, sometimes rising in spiral turns, and then

descending rapidly, uttering a clear shrill cry of *kae, kae, kae*, several times, and often continuing it some minutes. These gyrations occur more commonly in the spring; perhaps it is a nuptial ceremony, or a bridal pilgrimage. This bird does not always live in that domestic peace and harmony after rearing its young as is proverbially true of birds of prey, often fighting over some game that it would most faithfully toil to procure for its companion and little ones during breeding season. An amusing instance of this kind occurred to my knowledge. One of these birds caught a snake and flew high into the air; its mate followed and tried to force its companion to give up the coveted morsel. For a time I did not know but that they would have to settle it as did the two snakes, each of which had hold of a leg of the same toad, and neither being willing to lose its anticipated dainty repast, the largest snake not only swallowed the toad but also the smaller snake attached to his portion. (Query — Which got the toad?)

In their bill of fare snakes form quite an item in the spring and summer months, but in the winter months the wild game of our woods and the poultry-yard, satisfy the cravings of hunger. It is from the fact of its making such frequent inroads among our domestic fowls that it derives the name of hen-hawk. When capturing snakes they sometimes "wake up the wrong passenger." A farmer living in this vicinity, while putting up a fence around his pasture, noticed a large hawk on the ground some forty rods from him, sometimes rising up two or three feet, then dropping down. Supposing him to be devouring some game he paid but little attention to it at first, but from its continuing in the same place, and keeping up the same manœuvring for a long time, his curiosity was excited, and coming near the bird he discovered that the tail of a large black snake was coiled around the hawk's neck, and that the head and a part of its body was in a hole in the ground; the hawk was nearly exhausted. With a blow of his axe the farmer

severed the snake, and brought the hawk to his barn where he kept him alive for some time. The part of the snake attached to the bird measured three feet, which was, probably, about one-half of its length. The hawk evidently seized the snake when he was partly in his hole and was unable to draw him out, and when found, the serpent was endeavoring to convince the would-be-capturer that "it is a poor rule that don't work both ways." This was the adult Red-tailed Hawk.

In procuring food for their young they frequently act in concert, and if, perchance, they spy a squirrel on a tree one will dive at it while the other poises itself ready to seize it if it dodges to the other side to evade the grasp of the first hawk. From the two there is no escape. Grasping it firmly by the neck the assailant practicably demonstrates the possibility of garroting its victim, when the ill-fated squirrel is carried to the eyry, and torn in pieces to satiate the cravings of their rapacious young. I was informed by one of my collectors that he saw a mink taken in that way by a Red-tailed Hawk, and carried off, although squealing piteously, and vainly endeavoring to extricate himself from the fatal grasp of its cruel talons.

For hours it may be seen sitting in the top of some tree, either sunning itself or watching for game, and woe be to the rabbit, squirrel, bird, or mouse, that attracts his keen eye. In sailing over fields, if it discovers game, it will either grasp it by a side stroke, or check its speed and alight on a tree, if near, where it can watch its motions, when with wings almost closed it will dart upon its prey with unerring aim.

When wounded, like all rapacious birds, it will turn on its back and defend itself with its claws and bill, grasping a stick presented to it so firmly as to be raised from the ground and carried some distance before relinquishing its hold. An instance was related to me illustrating the strength and tenacity of its grasp. A sportsman having

winged one of these birds his dog ran up to it, when his nasal appendage was firmly seized by the enraged bird. Smarting under the chastisement he howled and yelled, shaking his antagonist with force enough, apparently, to dislocate every bone in its body. This was continued sometime before its claws were disengaged, when my informant said "that the dog's nose looked as though it had been *chawed*."

They formerly nested here, but I have not been able to find a nest for the last fifteen years. The nest is large and somewhat flat, composed mostly of sticks and twigs, and generally located where it is almost impossible to get at it. According to our writers on oölogy they lay from four to five eggs. This is a larger number than I have found; from two to four has been the usual number. They are dull white, sparsely covered with brown and dark-brown spots. Both birds assist during incubation. Its length is from nineteen to twenty-four inches, and the expanse of the wings from forty-five to fifty inches. The female is considerably larger than the male, as is the case with all our rapacious birds. The head of the adult is large and flat; the tip of the bill much incurved, with the entire upper parts brown, with fulvous edging on the head and neck. The tail is bright rufous, tipped with white, and a little rounded, with the subterminal band of black. The throat is white with longitudinal strips of brown; the under parts are yellowish white with longitudinal brown spots. The under tail-coverts are yellowish white, the legs are yellow, and the iris, hazel. In the young the upper parts are lighter brown than in the adult, with more white and fulvous spots; the tail has some nine or ten transverse brownish black bands and is tipped with white; the subterminal band is about an inch wide; the under parts are white with large ovate spots of brownish black; the under tail-coverts are spotted with brown. The smaller wing-coverts, from its flexure to the body, are rufous, and similar to the Red-shouldered Hawk, only not as bright rufous.

The only resemblance between the adult and young is in the general form of the head, bill, legs, and claws. It is no wonder that naturalists considered them different species. Nuttall described the young as the American Buzzard (*Falco Buteo*), Pennant as the Great Hen-hawk (*Buteo vulgaris*), and Wilson named it the *Falco Leverianus*. He says, however, "it is with some doubt and hesitation that I introduce the present as a distinct species from the *Buteo borealis*. My reason for inclining to consider this a distinct species is the circumstance of having uniformly found the present (*Falco Leverianus*), two or three inches larger than the former (*B. borealis*).

Ornithologists at that time were not generally aware that the young of many of our birds of prey were longer than the adult. This is very marked in the Goshawk and Bald Eagle. This seeming absurdity is easily explained. After moulting the long feathers never attain their former length. If Wilson had been aware of this fact he never would have introduced the young of the *Buteo borealis* as a distinct species.

RAMBLES IN FLORIDA.

BY R. E. C. STEARNS.

PART III.

From Cedar Keys to Egmont Key is eighty-five miles. The latter is situated at the mouth of Tampa Bay, and is forty miles from the town of Tampa; upon it is a light-house whose friendly flame shone far across the waters of the Gulf as we steamed along in the early gray of the morning. We had arranged to land at Egmont, wind and wave permitting, as it is good working ground for the naturalist; but a rough sea compelled a change of plan, and we kept on for Tampa.

Tampa Bay is divided at its upper portion, or head, into two smaller bays, one known as Old Tampa Bay, from the town of "Old Tampa," the other as Hillsborough Bay,* which receives a river of the same name. It is upon the southerly bank of the latter that the new or present town of Tampa is located. A very narrow and crooked channel and an insufficient depth of water prevent vessels, excepting very small craft, from reaching the wharves, consequently the steamer was anchored some four miles below the place. Viewed from the deck the scenery is attractive, though the shores, as elsewhere, are quite low. As you face the town upon the left hand, and half a mile off, is Ballast Point,† an ancient reef; upon the right are islands and the mainland in the distance; in front the military post of Fort Brooke,‡ with its new buildings half-hidden by the sturdy old oaks (*Quercus virens*), whose stalwart limbs are decked with robes of the long Spanish moss, which hang motionless in the quiet air, or flutter like tattered battle-flags when moved by a passing breeze. The post is built upon a sloping lawn whose margin is washed by the waters of the bay; in front of the trees is the parade ground, in the centre stands a symmetrical flag-staff, from the top of which, far aloft, floats the national flag.

There is some little commotion in getting ashore, for everybody and everything have to be transferred to lighters and small vessels; at the time a transient shower was passing and the warm rain caused an unpleasant stickiness. It was soon over however, and we saw our packages placed

* There is a county of this name, of which the city or town of Tampa is the county seat.

† A very interesting spot to the geologist. Here we collected over a hundred species of fossils from the fossil coral, and obtained many beautiful specimens of Chalcedony; and it was without doubt from this locality that the aborigines of this part of the state procured the material from which they made their arrowheads.

‡ The military reservation at Tampa is situated upon and embraces the healthiest and by far the pleasantest portion of the place. Many of the older officers of the United States army have been stationed here, as it was an important base during the wars with the Seminoles. It is reported of Gen. Taylor that he was so much attached to the locality, that when, at the time he was President, the Secretary of War proposed to sell the post, the old soldier positively forbade it.

safely in a four-ton sloop, and seated ourselves upon the top of the cargo like statues upon a pedestal. The lines were "let go," and after beating in a light wind the sloop was at the wharf by noon.

When a steamer arrives the event is published by a certain number of strokes on the Court House bell; hence the crowd at the wharf. Friends met us as soon as we landed, and with their assistance we found an unoccupied house and an unemployed negro; the former was at once hired for a camp, the latter for a commissary and quartermaster.* In two hours after landing we were "at rights" and housekeeping. Elated with this wonderful dispatch, in the fulness of our joy we thought the millennium not more than "two blocks off," and rashly named our quarters "Camp Delight;" but we had unwisely crowed before we were out of the woods, as will presently be seen.

The population of Tampa is variously stated at from eight hundred to one thousand (people), of all sizes and colors; but this does not include the million (of fleas) that nightly met in mass-meeting at Camp Delight, and compelled us, both in sorrow and in anger, to change the name to Camp Misery. The fleas of California, the black-flies of the Lake Superior swamps, the mosquitoes of the Ohio Valley, all of these we had met on their own ground and never winced, but the fleas of Tampa proved invincible. We thought of the saying of a German poet, "God made the world, but the devil made the flea."

The appearance of the town creates a favorable impression, for it is well planned, the streets being wide and regular and the buildings comely; many of the streets and yards are ornamented with trees; in some of the latter the bananas were just shooting up new leaves to replace those that were cut down at Christmas time by an unusual and severe frost. A large specimen of the American aloe (*Agave Americana*)

*Soon after our departure from Tampa, our colored quartermaster was elected City Marshal.

standing in the Post Office yard perished from the same cause, though a rosebush near it was loaded with red flowers.* Many of the orange trees were full of fruit, which was ruined by the fatal blast, and bushels were rotting on the ground. In some sheltered spots or warm places on the shore of Old Tampa Bay they were untouched, and we had many a feast upon the golden fruit from that neighborhood. The Florida oranges we consider superior to the Mediterranean, Mexican or Tahitan; they are of large size, good color and fine flavor. The Shaddock (*Citrus decumana*) also grows in the vicinity of Tampa, and very fine specimens of the fruit were purchased by us at the stores. It is extensively cultivated in the West Indies, and many people prefer it to the orange; it is slightly bitter, and the juice, a mild acid, is cooling and healthful. It is called Grape Fruit by the Floridians. Not far from our camp is a grove consisting principally of pines of the species *Pinus palustris*, also called the pitch-pine, and long-leaved pine, and *P. tæda*, known as the loblolly pine, and many may be seen in the streets and elsewhere about the town; they sometimes attain a height of one hundred feet, but we have as yet seen none that exceeded seventy feet. The *Chamærops serrulata*, or Saw Palmetto, here, as everywhere in South Florida, grows luxuriantly in the sandy soil, and just outside of the town it seems to have crowded out all other shrubbery.

Without enumerating the many botanical forms that are met with in this section of the country, a few of the prominent species worthy of mention are the Sweet Bay (*Magnolia glauca* Linn.), which grows to the height of twenty feet, with highly perfumed flowers and shining leaves (an isolated colony of this species sheds its fragrance on the colder air of the north, being found in the vicinity of Gloucester, Mass.); the Southern Buckthorn (*Frangula Caroliniana* Walt.), a species of Hawthorn; the *Catalpa*, or Indian-

*This was in the latter part of January.

bean; also the *Persea Carolinensis*, or Alligator pear,* sometimes called the Red Bay.

The banks of the Hillsborough River at the water's edge are muddy, with a growth of tall coarse grass. The bivalve shell, *Cyrena Carolinensis*,† may here be obtained; also the pretty little river snail, *Neritina reclivata*. From the wharves, at the proper tide, many fish are caught, principally Sheep's-head (*Sargus*) and Mullet (*Mugil*), both of which are good eating. The supply, however, is quite irregular, and the market therefore cannot be depended upon. Oysters (*O. Virginica*) of excellent quality abound in the bay, and can usually be purchased from boats at the wharf. During a portion of the period of our stay at Tampa the market was well supplied with venison (*Cervus Virginianus*) of good quality, thanks to the energy and skill of an one-armed hunter residing a few miles away. The hens of Florida deserve favorable mention, if not a diploma, for their daily dividends were too important to be forgotten.

Stalking along the muddy margin of the stream may frequently be seen the Blue Heron (*Florida cærulea* Baird), and the White Heron (*Herodias egretta* Gray). There is a California species that much resembles this last. The White or Whooping Crane (*Grus Americanus* Ord.) and the great Blue Crane (*Ardea herodias* Linn.), and the Egrets (*Demigretti Pealii* Baird) with white plumage, and another (*D. rufa* Baird) of a reddish color, are found in this part of the state around the shores of the bay and gulf. Many others of the long or stilt-legged bipeds, of the feathered tribes belonging to the Grallatores, or waders, are met with when rambling through the marshes or exploring the bends, inlets or sloughs of the river, or are seen by us from the boat while

*We were unable to obtain any of the fruit at the time of our visit in the winter; it was quite likely out of season. A species grows in Mexico, but whether identical with the Floridian we do not know. The Mexican fruit is nearly round, of the size of an orange; it has a bright green skin or rind, and contains a pulp of a peculiar flavor which melts in the mouth like butter. It is eaten with pepper and salt.

†Valves of this shell were found by us in the shell-heaps, but are not common.

rowing up or down the stream. With a scoopnet rigged with a long pole, an important and at many times an indispensable implement for the collector, we dipped up from the bed of the stream a small white bivalve shell (*Tellina*), and a single dead specimen of the fresh-water Mussel, *Unio* Jewettii* Lea. The Floridian Unios have much lighter shells than most of the species found in the tributaries of the Ohio and Mississippi Rivers.† The once famous British pearls were obtained from a species of Unio (*U. margaritiferus*) found in the mountain streams of Great Britain, and the fishery was continued till the end of the last century in Scotland, where the mussels (Unios) were obtained in the River Tay by the peasantry previous to harvest time. The British pearl fishery has long ceased to be remunerative.

The fresh-water mussels must be exceedingly scarce in this vicinity, and in fact for many miles on the western side of Florida, for we found none living nor a fragment in any of the mounds and shell-heaps that we examined. The Portuguese and Spanish narrators of the expedition of De Soto have given absurd accounts of the quantities of pearls in the possession of the natives. It is highly probable that the Indians inhabiting Georgia and Alabama, at the time of and prior to the invasion of De Soto, lived in part upon the animals of the various species of Unio found in the rivers of those states,‡ for "heaps of mussel shells are to be seen on our river banks wherever Indians used to live."§

It may be that the Indians referred to collected the shells solely for the purpose of procuring the pearls; yet the proportion of shells containing pearls is so small that when, as mentioned in the text, "the Portuguese narrator says they

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* Unio, a pearl.

† The river mussels are found in the ponds and streams of all parts of the world. In Europe the species are few, though specimens are abundant. In North America both species and individuals abound. (Woodward.)

‡ George Gibbs, Esq., informs us that shell-heaps of Unio valves may be seen on the Klamath River, in California, about one hundred miles from its mouth, and that the animal was used as food by the Indians as late as the years 1851–'52.

§ See foot note, Irving's Conquest of Florida. Ed. 1869, p. 246.

obtained fourteen bushels of pearls"* from a certain sepulchre, and as can be found at another place in the text that a common foot soldier, whose name is given as Juan Terron, had "a linen bag in which were six pounds of pearls;"† and elsewhere, that everybody, Spanish and Indian had pearls, and "as large as filberts;"‡ either the sources from whence the old historians derived their information were unreliable, or the Unios which are probably as abundant in the rivers as heretofore, have, to a very great extent, ceased to manufacture these much valued concretions. The latter case is hardly supposable. Perhaps one shell in a hundred might yield a pearl, of which not one in a hundred would be either clear or of perfect form, and not one in many thousands would be as large as a filbert.§

Between Camp Misery and the river, in wet or springy places upon the under side of pieces of boards or chips, many snails (*Helix volvoxis* Pareyss) can be collected, and the Coffee-shell (*Melampus caffea*) is close at hand. It is also found in the West Indies. Just outside of the fence that encloses the reservation of Fort Brooke, to the south, is a good place for obtaining *Glandina truncata*, a species of snail with a shell of a pink color, sometimes three inches long. It looks much like one that is found in Nicaragua (*G. rosea*). The Glandinas are carnivorous, and our Floridian is a cannibal, and eats without either hesitation or remorse the smaller snail, *Helix volvoxis*. The eggs of Glandina are of a whitish color, and about the size of a very small pea; it lives in moist grassy places, and a few boards that were on the ground at the locality referred to made an excellent trap; the Glandinas prefer the shade, and in order to protect themselves from the heat of the sun, hid themselves under the boards, which we frequently turned over,

*Irving's Conquest of Florida. Ed. 1869, p. 230. †Id., p. 239. ‡Id., p. 245.

§"An account of the Irish pearl-fishery was given by Sir. R. Redding, in the "Philadelphia Transcript," 1693. The mussels were found set up in the sand of the river-beds with their open side turned from the torrent. About one in a hundred might contain a pearl, and one pearl in a hundred might be tolerably clear." (Woodward's Recent and Fossil Shells, p. 434.)

always capturing some. Upon one occasion, in addition to several Glandinas, two specimens of a beautiful lizard rewarded our search.

We had heard at sundry times marvellous stories of numberless snakes of divers species, and of assorted sizes, that lay in wait to swallow, crush or poison unsophisticated strangers. These fearful tales led us to keep a sharp look-out when on the tramp. Either the snakes snuffed danger from afar and "hunted their holes," or else they are scarce, as we failed to secure a specimen, though two or three were seen. We concluded that our informants had in some way deceived their eyes by using the fusil oil which hereabouts is sold for whiskey, one dram of which would cause the drinker to see not only snakes but an entire menagerie. From the time when the serpent made mischief for the human race through the beguilement of its original mother, down to the present day, the snake family have had a bad reputation, and stories illustrating their wickedness, however preposterous, are readily believed.

Near the town, and in the immediate vicinity of the spot where Glandinas "most do congregate," stands an ancient mound, in shape a flattened hemisphere, with the plane side down. Its position is such as to furnish a delightful out-look upon the bay and a fine view of the surrounding scenery. It is not of large size, being only one hundred and sixty paces in circumference and fifteen feet high; it was formerly more nearly semicircular in perpendicular outline, as the rains of centuries have washed it off at the summit, thus reducing the elevation, and consequently increasing the circumference of the base.

The mound was covered with grass, and many stately trees are near it whose graceful proportions form, by contrast with the general flatness of the ground, a conspicuous and charming feature in the landscape. From the investigations made by our party it was undoubtedly devoted to burial purposes, and but few shells were used in its con-

struction. Six species of the common marine shells of the neighborhood were collected; also stone implements, and pieces of crumbling bones,—portions of the skeletons of men. This mound* may have been the "artificial eminence near the shore," upon which stood the dwelling of the cacique, Hirrihigua, who bravely opposed the adventurous but cruel Pamphilo de Narvæz in his expedition to Florida, in the year 1528; and the meagre remnants of a human form whose sepulchre we had rudely violated, may have belonged to the outraged and vindictive chief, who, stung by the remembrance of his wrongs, replied to the overtures of De Soto with words of scorn.†

THE SYLVA OF MONTANA.

BY J. G. COOPER, M. D.

The following notes comprise an enumeration of the trees of the Rocky Mountains, etc., from Fort Benton, Nebraska, to Fort Colville and Fort Dalles, Oregon, with remarks on their distribution.

Smooth Sumac (*Rhus glabra?*). No species extends along the Upper Missouri above Fort Union, and I am therefore inclined to think that the species of the Columbia Plain, which extends north to Fort Colville, is distinct though nearly allied to this. In Walla Walla valley it becomes fifteen feet high, and may attain, farther south, to the size of a small tree. It grows also in the Yakima valley, and west to Fort Dalles, Oregon.

Ash-leaved Maple (*Negundo aceroides*). The Box Elder reaches the Rocky Mountains at Fort Benton, but does not cross them there, no species reaching the Columbia

*Vide Irving's Conquest of Florida. Ed. 1869, pp. 28, 58, 59.

†Hirrihigua said, "I want none of their speeches nor promises; bring me their heads, and I will receive them joyfully." Id., p. 60.

river, though the climate is so much milder than that of the Upper Missouri. This is an additional reason for considering the western species (of California, etc.) distinct from the eastern, though that of Utah and Western Texas may very probably be the latter. The *Rhus* shows a distribution the reverse of this, as compared with the eastern *R. glabra*.

Smooth Maple (*Acer glabrum*). This commences to appear at the eastern base of the Rocky Mountains, and grows entirely across to Fort Colville and the east slope of the Cascade Range, becoming forty feet high and a foot in diameter. *A. tripartitum* Nutt., is merely a young or dwarfed form of it in dry soil.

Choke-cherry (*Cerasus Virginiana?*).* A tree, apparently this species, grows all the way across the mountains, extending to the Bitterroot Range, and growing thirty feet high and six inches in diameter. A small cherry tree, or rather a shrub, grows about the borders of the Columbia Plain, apparently the same in leaf, but I think the fruit is larger. I have never seen the flowers.

Cherry (*Cerasus mollis?*). I found a shrub at the Cœur d'Alene Mission and westward, which I took for this from the leaves. It is stunted in that latitude.

Western Mountain-ash (*Pyrus fraxinifolia? vel Americana?*). The Mountain-ash of the western mountains, scarcely distinct from that of the north-east, first appeared on the east slope of the Cœur d'Aleñe Range, and extends in small numbers to Fort Colville, scarcely deserving to be called a tree anywhere. I did not find it with fruit on this route.

River Hawthorn (*Cratægus rivularis*). A hawthorn with black berries, and otherwise the same every way, extends from the east base of the Rocky Mountains, west to the Cascade Range ("Willamette River," Nutt.), forming a shrubby tree fifteen to twenty feet high. It is finest along the Spokan River.

* See Torrey and Gray's Flora of Nebraska.

Red Hawthorn (*C. sanguinea?*). The red-berried Haw grows sparingly from Walla Walla to Fort Colville, but is so similar in leaf to the preceding that it may perhaps be only a variety. Specimens of both collected in fruit give an opportunity of trying the distinctions of the seedling plants.

Oregon Bearwood (*Frangula Purshiana*). This species of Buckthorn occurs on both slopes of the Cœur d'Aleñe Mountains, but not farther east. With it occurs a low bushy species of *Rhamesus*, as shown by fruiting specimens of each collected together.

Oregon Service-berry (*Amelanchier alnifolia*). I must consider this distinct from *A. Canadensis* of the east, because it preserves its peculiarities of leaf, growth and fruit, from the eastern base of the Rocky Mountains to the Pacific coast, through much variety of climate and soil, differing only in height in the drier localities. It attains its greatest luxuriance and excellence of fruit in the valley of the Hell Gate river, where our whole command feasted on the berries for several days.

Green Dogwood (*Cornus pubescens*). It was first seen near the crossing of Bitterroot river, and extends at intervals to the west coast.

Western Sugar-berry (*Celtis reticulata*). This tree is strictly limited toward the north-west by Snake and Columbia river, as observed in 1853. It is scarce along them and grows only about thirty feet high, with a short trunk sometimes a foot thick.

Oregon Oak (*Quercus Garryana*). This oak does not grow east of the eastern base of the Cascade Range, or north of the Yakima river, on this side. No oak occurs from the Columbus river to Fort Union, on the Missouri, near which place is found *Q. macrocarpa*. No ash grows in a similar interval, though one extends to Milk river on the Missouri.

Oregon Ash (*Fraxinus Oregona*). This first appears at the Dalles.

Western Pogue-birch (*Betula occidentalis*). This birch forms a shrubby tree, from Sun river through the Rocky Mountains to the Cœur d'Alene river, where it becomes of large size, sometimes two feet in diameter and sixty feet in height, of handsome appearance, and with a laminated bark of which the Indians make canoes. The color of the bark is of a pale coppery yellow, dark on the branches, and the leaf is always quite small. It is common at Fort Colville, where I took it for *B. papyrifera*, when leafless, in 1853, and the dwarfed form, growing along streams of the Great Plain to the Cascade Mountains, is the *B. resinosa* of my report. I saw it at Fort Walla Walla, but not at Fort Dalles.

Green Alder (*Alnus viridis?* or new species (perhaps *rubra* of Bengard Veg. Sitch.). This alder has a range similar to that of the western birch, and attains a similar size toward the west. Its bark is less white and its leaves finer toothed than those of *A. Oregona* near the coast, which I first saw at Fort Dalles.

Willows (*Salix*). The willows were only to be had in leaf, and if determinable, will probably prove to be *S. Fendleriana*, *Hookeriana*, and *longifolia*, but I cannot give accounts of their respective distribution, as these trees need long acquaintance to distinguish them by the leaves only.

Narrow-leaved Poplar (*Populus angustifolia*). This peculiarly western poplar does not extend east of the base of the Rocky Mountains at Forts Benton and Laramie. It varies much in the leaf, even on the same tree, some being four inches wide; and though I believe it to be the most common species in the mountains, I was often in doubt whether this or *P. balsamifera* was the most so, as I could not always distinguish between them at a little distance.

Balsam Poplar (*P. balsamifera*). This seems to be the prevailing species of "Cotton Wood" along the Missouri above Fort Union, and across the Rocky Mountains, and is not uncommon to the west coast. The tree seems dis-

tinguishable when leafless by its yellow twigs. I doubt whether *P. monilifera* grows so far north in the mountains.

Aspen (*P. tremuloides*). The aspen occurs at intervals throughout the mountains, usually about gravelly ponds, but is not common.

Twisted Pine (*Pinus contorta*). I first met with this pine at the east base of Mullan's Pass, where a single tree of unusual size seemed to me at first distinct from this species. It was two feet in diameter, and fully sixty in height, the branches crowded with cones of all ages, but west of the pass I found the more usual form abundant, which indicated this to be only a luxuriant specimen. It is the most prevalent tree of the higher Rocky Mountains, as far down the west slope as Deer Lodge prairie. It then becomes rare in the valley until reaching the crossing of the Bitterroot, when it again becomes abundant, forming groves by itself on poor sandy or gravelly soil exactly as on the coast. Towards the rainy summit of the Cœur d'Aleñe Mountains, however, it is scarcer, being the seventh in abundance of the trees; it is still rarer on the west slope, but at the Mission rather common, though not observed much farther west. Its growth seems like that of most other trees more dependent on a certain degree of moisture than on temperature.

Pitch Pine (*P. rigida*). This eastern species is common on the eastern spurs of the Rocky Mountains, in the upper "Bad Lands" of the Missouri, from Milk to Judith river, and on the "Black Hills" near Fort Laramie, but I did not find it west of the Rocky Mountains or of Fort Benton.

Yellow Pine (*Pinus ponderosa*). The Yellow Pine is the prevailing species in most parts of the Rocky Mountains traversed, though much less common than others in the Cœur d'Aleñe Range. It presents the same appearance from the east base of the Rocky to that of the Cascade Mountains, being unmistakable as far as it can be seen. On the Hell Gate I saw the largest, some fully four feet in diameter, and it grows in the driest sandy soil, where no other

tree can exist. *P. Banksiana* and *P. resinosa* have been reported to grow along the Spokan river, but I am sure none occurred at parts I have visited, and think this and the preceding have been mistaken for them.

Western White Pine (*Pinus monticola*). I found scattered trees of this beautiful species on the highest parts of the Rocky Mountains, but from the east base of the Cœur d'Aleñe Range to its summit it rapidly became one of the most abundant and luxuriant trees, again disappearing gradually, but faster, as we descended their west slope. It attains a diameter of four feet, and a height, probably, near one hundred and fifty, resembling the eastern White Pine (*P. strobus*) in habit, but with finer grooved bark (like that of *Carya tomentosa*, Mockernut), more slender and shorter leaves, and much larger cones. The wood is very fine-grained and soft. The specimens, from stunted trees in the Bad Lands at Little Rocky Mountain creek of the Missouri, are so different as to seem distinct in species, or at least a very marked variety, probably the latter.

Black Spruce (*Abies Menziesii*). This Black Spruce is as abundant on the higher parts of the Cœur d'Aleñe as on the coast, and presents exactly the appearance described in my former report. It is perhaps less in size, but has the same drooping, dense twigs and foliage that give so sombre an appearance to the coast forests. I saw it nowhere else on the route.

Oregon Yellow Fir (*A. grandis* and *amabilis*). From many specimens of cones and leaves, together with observations on the trees, I am strongly inclined to consider these the same species, not varying more than several others. The lower white and smooth-barked form, with dense growth and foliage, appeared moderately common on the east slope of the Cœur d'Aleñe Mountains, and across the summit. On the west slope it gradually became taller, more open in branches and foliage, the cone larger and with broader scales, the bark grooved more and more, and darker in

shade until in the rich moist bottom-land the tree is one hundred and fifty feet high and over four feet in diameter. This is the true *A. grandis*, and the same as grows along the Lower Columbia, while a middle form occurs sparingly about Puget's Sound, and was referred to by me in a former report as possibly being the true *A. taxifolia*, for which see the notes on *Abies Douglassii*. The dense growing, white-barked variety (*amabilis*), attains three feet in diameter, and one hundred feet in height, on the east slope of the above-named mountains.

Douglass, or Red Fir (*Abies Douglassii*). This spruce exhibits nearly as much adaptability to all circumstances as *Pinus ponderosa*, which it accompanies throughout the Rocky Mountains, but is much less abundant in the drier situations than that, and more so on the moist Cœur d'Aleñe Range. It varies in the color of the bark, length of cones, leaves, etc., as might be expected in so many localities.* The young shaded tree, growing in the moistest spots, has leaves an inch and a half long, shining, and the bark smooth and white, so that only the single arrangement and more lax growth distinguish it from young trees of *A. grandis*. This is doubtless the true *A. taxifolia*, as before suspected, and loses its distinctness of character with age. This form, with very long slender leaves and cones, prevails mostly on the west slope of the Cœur d'Aleñe, Cascade and Coast ranges, where there is most rain. The largest Rocky Mountain trees do not quite equal some of those on the Lower Columbia. It is the only spruce I saw from Fort Colville to the Spokan river, where its range is stopped by the Great Columbia Plain. It reappears at the Dalles, and probably also on the Blue Mountains.

After observing these coniferæ, and other trees also, for some time, the eye learns their general habit so well, that there is usually no difficulty in distinguishing species at sight, and at a considerable distance off.

* It grows on the first mountain range, nearly as far east as Milk river, to longitude 107°.

WILLIAMSON'S SPRUCE (*Abies Williamsoni*). This fine spruce is abundant on the summits *only* of the Cœur d'Aleñe Mountains, where it grows three feet in diameter, and one hundred feet in height, with a ragged gray bark much like that of the eastern Sassafras. The general habit is like that of the Hemlock Spruce, but rather stiffer, and the foliage is denser, forming several imperfect rows on the twigs. The cones are two and a half inches long, pendant from the highest branches only. None of them contained ripe seed at the time of my visit. The wood appears much like that of the Hemlock Spruce. The closeness of its limitation to the dividing ridge is remarkable, since, although found at the base of this ridge, it there grows only from three to six feet high, and produces no cones. I took these at first for some species of Juniper. Newberry's figure represents it as being too rigid, like *A. Douglassii*. It is far more feathery.

MERTEN'S SPRUCE (*A. Mertensiana**). I have long considered this distinct from *A. Canadensis*, though the difference, if any, is only in its larger growth, and perhaps in the glands of the seed, which I have not compared with those of the eastern tree. There is however a wide interval in their range, *A. Canadensis* not growing north or west of Lake Superior. I first met with this on the west slope of the Cœur d'Aleñe Mountains, only a few dwarf fruitless specimens growing on the east side, and none on the summit. It ceases west and north of the Lake on the route I followed.

WESTERN LARCH (*Larix occidentalis*). I found this fine Larch first near Bitterroot valley, whence it becomes rather common throughout the route to Fort Colville, holding a middle place in relation to the moisture and temperature of the various portions. It is about equal to *Pinus ponderosa* in size, but has very short branches, as they break off from the brittleness of the wood as it grows high. The bark is

* *A. Bridgei* Kellogg. Proc. Cal. Acad., 1858–'59.

reddish like that of the pine, but only an inch or two thick instead of four or five, and of course less deeply furrowed. The pale, elegant foliage, is easily distinguishable where it forms groves on the mountain slopes, but it is more scattered in its distribution than most coniferæ, never, as with the eastern *L. Americana*, growing in swamps.

Western Arbor-vitæ (*Thuya gigantea*). Scarce along the lower part of the Bitterroot, this enormous tree becomes fully developed only on the west slope of the Cœur d'Aleñe Range, where a cedar swamp occurs, the trees, perhaps, even larger than near the coast. They range from six to eight feet thick, and a dozen of these giants often grow in a space of five or six rods square, so that Lieut. Mullan's party could not find room to pass between them, and had to cut down some, the road going over the stumps! Nothing compares with this in tree growth except perhaps the *Taxodium* swamps of the Gulf States, and here the cedars seem to have grown from sand and water only!

Red Cedar (*Juniperus Virginiana*). This grows large and abundant along the Upper Missouri, and more scattered, though still a tree, entirely across the Rocky Mountains, following the rivers around the Cœur d'Alene Range to Fort Colville, and south to the Spokan river at least. I was told that a large grove of it (or possibly *occidentalis*) grew on the north-west border of the Great Plain of the Columbia, but could not determine which those are which grew near Fort Dalles. I was very much puzzled to determine whether this or *J. communis* was the species sometimes seen on the Upper Missouri, of a tree form, but with large berries. It may be a hybrid, or perhaps *J. occidentalis*, with which it agrees in the colorless wood. *J. communis*, in its low prostrate forms, is very common along the Upper Missouri, but I did not see it farther west, and the dwarf form of the Cascade Mountains, found in 1853, *may* belong to *J. occidentalis*, though Dr. Newberry found farther south on these mountains what he considers *J. communis*.

OREGON YEW (*Taxus brevifolia*). The Yew, first met with on the east slope of the Cœur d'Alene Mountains was there low and prostrate like *T. Canadensis*, but became larger on the west side, attaining two feet in diameter and sixty feet in height, exactly resembling that of the coast. It does not pass Lake Cœur d'Aleñe. The elevation of the east slope of these mountains is much greater than of the west, which accounts for the dwarfing of this, as well as of *Abies Mertensiana* and *A. grandis*.

DISTRIBUTION OF THE FORESTS, ETC., WITH FACTS RELATING TO PHYSICAL GEOGRAPHY.

The configuration of the country traversed, as well as its productions, climate, etc., naturally divide it into four sections, which have limits closely connected with those of the geological formations. A closer exploration would perhaps also separate these into a larger number, but I propose now to speak of them chiefly in connection with the distribution of the forests, which everywhere indicates to a great extent that of the smaller plants and animals also.

*Hesperian Region.**—From the Rocky Mountain summit, east to Milk river, the country, although the prairie vastly predominates, is crossed by the easterly ranges of the Great Cordillera, upon which are found several trees peculiarly western, with some eastern species commingled. Though low where the Missouri breaks through, the mountains rise to a great height in the distance, and are said to be well wooded on many portions. Of this we had evidence in the large quantity of coniferous timber covering the rocky hills and bluffs, from above Milk river nearly to the Judith.† Its growth was limited only by the prevalence of fires wherever

* In my article in the Smithsonian Report, 1858, I called this the *Paducan*, but as that name is preoccupied in Kentucky, I now propose that here given, and think *Hesperia* would be far more elegant and appropriate than the sentimental "Wyoming" for the new territory which includes most of the region referred to.

† A sharp double bend in the river, below the Mussel Shell, near longitude 108°, is the point where it has cut through the mountains by a canon, with nearly vertical walls 600 feet high!

the grass grows well, and therefore trees became very scarce when we entered the "Cretaceous formation No. 1," which is of a porous character, not retaining moisture in its strata like many parts of the Tertiary farther down, though covered with a very close growth of grass. As usual throughout the route it is the slopes facing the north that have most of the woods on them. The species met with were the eastern *Pinus rigida* and *Juniperus Virginiana*, the boreal *J. communis*, the western *Pinus monticola* and *Abies Douglassii*. If any other occurs it is, probably, *Pinus ponderosa*, which grows in the Black Hills toward the south-east, according to Dr. Hayden.

Along the rivers a different group, the deciduous trees found in that situation throughout the plains of the Missouri basin, reached a little above Milk river, nearly all, however, ceasing at the point where the mountain woods begin.* Above here only *Populus balsamifera* occurs in scattered spots with stunted shrubs of *Negundo aceroides* and *Prunus Virginiana*, so that for several days below Fort Benton, one hundred and seventy-five miles by the river, the boats could scarcely obtain enough wood for fuel, and there is almost none to be seen. *Populus angustifolia* also begins at Maria's river, and is the prevailing species along the upper branches of the Missouri. The same destitution of wood continues from Fort Benton to the "Gate of the Mountains" along the Missouri, though its branches are better supplied with the same trees. Thus the influence of the soil belonging to "Cretaceous No. 1" is the same throughout its limits, but I believe is due to the causes above mentioned rather than to its Cretaceous nature, since on the lower Missouri it is much more productive of timber than "No. 4" of Dr. Hayden's section, or his "lignite tertiary basin," probably because it there receives more rain.

*Those seen below *only* (above Fort Union) were *Fraxinus Americana* (or *sambucifolia*? or both) and *Ulmus Americana*, the former pretty common, the latter rare. *Quercus macrocarpa* does not pass the Yellowstone.

Though we merely skirted the northern limits of the Hesperian region it shows, even there, sufficient distinctness of products to separate it from the "Dacotan" east of Milk river. Even its woodless plains differ materially in vegetation, having a better growth of grass, and in some very sandy tracts, presenting the shrubby forests characterizing the whole "Rocky Mountain Province." It evidently runs into the "Saskatchewan" region to the north, which is truly a "Campestrian" one. Farther explorations will doubtless reveal more spurs of the Rocky Mountains near the one hundred and seventh meridian, with the western trees covering them, and the fall of the Missouri, with its lofty cliffs throughout this region, plainly shows that even the plains form an elevated plateau, or basin, from which the descent to the "Dacotah" plains is by a sort of step, often sudden, or marked by the protrusion of lower rocks above or near to the surface. I have generally found that the *base* of a mountain range formed a stronger limit to the range of species of trees than the summit, and this fact is illustrated in the present case by the change occurring above Milk river at the first mountain range. The rule extends also to other plants and to animals, as all explorers will testify.

At the eastern base of the Rocky Mountains proper, where the Missouri literally cuts through them, the fact is repeated, and there I found the following western trees, which will probably be found also to reach the more eastern ranges: *Acer glabrum* (*tripartitum* is a variety), *Betula occidentalis*, *Alnus viridis* or *rubra?* (*viridis* is a boreal species) and *Populus angustifolia*. *Amelanchier alnifolia*, although a tree on the west side, is but a shrub on the east slope of the mountains, from the influence of a drier climate. It is said to extend to Lake Superior. *Populus tremuloides* is also a boreal species, occurring in the mountains everywhere above a certain elevation. Some other boreal species have been found by Dr. Hayden to straggle to the Black Hills, such as *Pinus Banksiana*, *Abies nigra* (and *alba?*). Though

I did not find them I have no doubt of their identity, having seen the specimens. It is somewhat singular that all the fresh-water mollusca I found in the Missouri, above Fort Benton, were distinct species from those obtained by Dr. Hayden in the streams east of the mountains (except *Unio luteolus* and *Physa heterostropha*), thus showing that the limits of the region apply to animals as well as plants. The rest were *Limnæa palustris*, *bulimoides* and *desidiosa*, *Sphærium striatinum* and *Margaritana falcata* Gld. Dr. Hayden found thirty other species in Nebraska.

Kootenay region.—My observations last summer confirm the propriety of this division of the north-western province (*Caurine*), being defined towards the south essentially as I marked its limits in the Smithsonian Report of 1858. It consists, south of latitude 49°, chiefly of the elevated basin of Clark's Fork, with the mountains which surround or traverse it, nearly all being more than 2000 feet above the sea (about 4000 feet where we crossed the Bitterroot), and from that extends up to perpetual snow at probably a level of 10000 feet.

Though, as shown by the accompanying notes, the western rim of this basin presents many marked differences from the portion east of the Bitterroot crossing, analogous to those between the Coast and Cascade Ranges farther west, I cannot now consider them distinct regions, but as united by the common character of being almost completely wooded. This character must also annex to it the lower country along the Spokan and the Columbia above that tributary, most of which is, however, so mountainous as to reach as high as the basin of Clark's Fork. The woodless portions of this region were small in extent along our route, being limited to the porous, dry tertiary and alluvial basins of Deer Lodge and St. Mary's valley, with small tracts in the valleys connecting and branching from them. The most extensive prairies are south of our route, towards the heads of these valleys, with a connected valley toward the north on Flathead river. So

generally are these prairies limited to the porous strata of the later formations that I believe some tracts of high prairie on the western slope of the Rocky Mountains indicate the presence either of tertiary or deep beds of drift, which latter cover the prairie summit of Mullan's Pass. It must be remembered, however, that this relation to different strata is the only one depending on their porosity, and that where rains are more abundant this ceases to prevent the growth of trees. Strata resembling the Cretaceous of Nebraska in density are on the west side thickly wooded, so that there is no indication of their nature from the absence of trees. The impervious rocks and thin soil of the Cœur d'Aleñe Range evidently assist the more rainy climate in producing a moisture fitted for the peculiar group of trees characterizing it, and there is a more marked difference in its opposite slopes than in those of the Rocky Mountains, more striking, however, on account of the greater number of species of trees found there. The contrast is most important between the west slope of the western rim and the east slope of the eastern.

Many facts show that the trees are more dependent on a certain supply of water than on temperature, as will be seen by comparing the profile of the route with the distribution of the species. Thus on the Rocky Mountains *Pinus contorta* grows only between 5000 and 6000 (or more) feet of elevation, an altitude just sufficient to catch the moisture passing over the general summits of the Cœur d'Aleñe Mountains, in which the pass we went through is 5100 feet high. It reappears at the east base of the latter range, because of the impervious rock there, and the increased moisture deposited on that rim. The various relations of other trees to the influence of moisture are shown briefly by the following facts of their distribution and growth:

Cerasus Virginiana?, *Amelanchier alnifolia*, *Populus angustifolia* and *Pinus ponderosa* are distributed entirely across, but are most highly developed along the Blackfoot

and Hell Gate valleys, forming the lower half of the east side of the basin, where there is, probably, a moderately dry and warm summer.

Acer glabrum (and var. *tripartitum*), *Betula occidentalis*, *Alnus rubra? Abies Douglassii* and *Cratægus rivularis* grow throughout but thrive most at the west base of the Cœur d'Aleñe Mountains, where there is much more rain and hotter summers (being 2000 feet lower in elevation).

Populus balsamifera and *Pinus contorta* are almost equally wide-spread; they are probably finest on the east slope of the Cœur d'Aleñe Range, where there is a comparatively rainy and cold climate which also favors the variety of *Abies grandis*, called *amabilis*.

Populus tremuloides and *Juniperus Virginiana* are so scantily distributed that no part of the mountains seems to suit them well, though found at intervals in gravelly soil where there is not much shade.

Larix occidentalis is mostly limited to the western rim, and is finest on its western slope.

Cornus pubescens and *Thuja gigantea* merely struggle up the Bitterroot river to the crossing, but are finely developed at the west base of the western rim with *Acer glabrum*, etc.

Pinus monticola is very scarce on the eastern rim and slope; it is a magnificent and abundant tree on the western, and finest near its summit.

Frangula Purshiana, *Pyrus fraxinifolia?* and *Abies grandis* are found over the whole western rim, but are chiefly developed on its western slope and base.

Abies Menziesii is limited to its higher parts above 4000 feet elevation. *A. Williamsonii* to those above 4500 feet.

Abies Mertensiana and *Taxus brevifolia* just straggle to its eastern slope, but are large and numerous on the western between 2000 and 4500 feet elevation.

Finally, *Cratægus sanguinea* and *Cerasus mollis* are confined to the lowest and warmest portions.

Thus while nearly all are found on the western rim, and

most of them grow largest on its western slope, only half of them reached the eastern rim along our route, and several of these were merely stragglers. This accords with the general rule that the most trees, both in number and species, grow where the most heat and moisture are combined. The forests of the western rim are far denser than those of the eastern, though the soil cannot be considered generally so good on account of the kinds of rocks from which it is disintegrated.

An exactly parallel case is presented by the Cascade and Coast Ranges, as described in the Natural History of Washington Territory (Pacific R. R. Reports), but there the species, though mostly the same, are somewhat differently arranged to correspond with differences in climate, consequent on the much lower elevation of those ranges and their nearness to the ocean. Yet we there find *Pinus contorta*, *Thuja gigantea*, *Abies Menziesii*, *A. Mertensiana* and *Taxus brevifolia* among the prevailing species at the level of the ocean, while here they do not occur lower than 2000 feet above it, showing that they require moisture rather than coolness of climate, for at the coast the rains are heavier while the mean temperature is far more mild than here. But *Pinus ponderosa*, *Acer glabrum*, *Betula occidentalis*, *Cratægus rivularis*, *Larix occidentalis*, *Pinus monticola*, *Pyrus fraxinifolia* and *Abies Williamsonii*, here characteristic trees, scarcely, if at all, cross the Cascade Range, while *Abies Douglassii*, and several peculiar species not found here, replace them between that and the Coast Range.

It is therefore much safer to assume a similarity in the moisture of the climate and soil of two regions thus widely separated, from comparison of their forests, than similarity in temperature. I am here comparing portions of two regions included between the same degrees of latitude, but according to another rule dependent on the climate of the western regions, all the above species of Rocky Mountain trees are found, or probably will be found to reach the coast

either north or south of these parallels, wherever they find the proper amount of rain and heat as combined in these mountains.

Shoshonee region.—The Great Columbia Plains show their peculiar features in prairies extending through the valleys on the route north to Fort Colville, which are, however, so small in extent compared with the forests, as not to be separable from the Kootenay region. Just north of the Spokan are the first extensive plains on the uplands, and to the south these become rapidly spread to the entire exclusion of forest, so that for days together not a tree is seen except shrubby willows on the banks of streams. Even the Blue Mountains show but a narrow strip of timber just along their summits in latitude 46°, which is said to disappear farther south, though the upper waters of the rivers flowing from them are pretty well wooded with deciduous trees. The only new ones that occur, and these only as stragglers from the south, are *Rhus glabra?*, *Celtis reticulata* and, perhaps, *Cratægus sanguinea?*, if more than a variety of *C. rivularis*. On the Walla Walla river are also found *Populus angustifolia*, *P. monilifera*, *Alnus rubra?* and *Betula occidentalis*. Some of the willows are, probably, also distinct from those of the mountains, but being undeterminable from leaves alone, I have omitted them throughout these remarks. (See notes on the trees observed, p. 405.)

A brief comparison of this with the plains of regions east of the Rocky Mountains, will show how little connection exists between soils or rocks and the growth of trees, how much depends on a proper amount of moisture.

The entire plain is underlaid by basalt, covered thinly with a fine dusty soil, which I believe to have been also volcanic in origin, having been poured out with lava in the form of mud. In parts this has been blown into high ridges, while in others it is washed entirely away, leaving the bare rock at the surface. This makes no difference however in regard to the trees, and little to other vegeta-

tion. This soil, on some ridges north of the Spokan where there is not much rain, is the richest I saw on the whole route, and produces fine crops near Antoine Plant's prairie. To the south it is covered with grass, etc., and where naturally irrigated by streams, other plants grow luxuriantly. There is then nothing unfavorable to trees in the soil, and indeed, west of the Cascade Range, almost the whole country is basaltic and covered with dense forests. We must look therefore to dryness as the cause of their absence, and so far the observations of the Medical Department, U. S. A., at Fort Walla Walla, Dalles, and Sincoe, show a remarkably small amount of moisture. For particulars, however, I must refer to the "Report on Statistics," etc., of Surgeon General Lawson, for 1860, prepared by Dr. Richard H. Coolidge, U. S. Army.

THE GOLDEN-WINGED WOODPECKER.

BY AUGUSTUS FOWLER.

This is an exceedingly valuable bird, especially if it resides near lands of a light or sandy soil. Its food is almost wholly composed of insects, of which ants form the principal living of the young fledged birds. These insect pests form themselves into colonies, and excavate, a little below the surface of the soil, one or more chambers, with galleries leading to them, bringing the soil from around the roots of the grass, leaving them to a free circulation of air, that soon causes them to wither. The Woodpecker sits by the mounds of dirt thrown out by the insects, and as one appears creeping from his den the bird draws him into his mouth with his tongue, and swallowing him, continues to do so until he has destroyed the whole republic. I have examined the birds at such times and have found their stomachs distended to their fullest extent; indeed it seemed as if they could not

contain one more insect, and yet, when taken, they were still in the act of devouring them.

The sagacity of these birds is wonderful in determining the locality of an insect that is concealed in the branches of trees, or in the solid trunk of a sapling. Instances daily occur of the benefits of the Woodpecker in extracting the borer from trees, and so nicely does he determine their exact locality that his first effort to secure his prize is successful. The bird alights on the trunk of the tree; the fact that a borer is gnawing at its heart is evident to him, and he hops around and down the tree, giving it a few taps with his bill, then slowly ascending and continuing the strokes lightly, when suddenly he stops and strikes a few successive strokes in the same place. He stops longer at that spot than at any other; he moves up the tree and taps there, but descends immediately to his last position. He has determined by the sound the locality of the worm and prepares to take him out. Fixing himself firmly on the side of the tree he throws his head back, and with a powerful stroke drives his chisel-pointed bill quite through the bark and into the solid wood of the tree. Stroke succeeds stroke in earnest repetition until he strikes upon his victim, and then thrusting his long barbed tongue into his body draws him out and devours him.

The Golden-winged Woodpeckers are, in some instances, permanent residents in New England; the larger part of them, however, migrate South, and return from the middle to the last of March. After having returned and selected their mates they soon begin to look up a place for a residence. The tree being selected they begin excavating it by digging a round hole, about two inches and a half in diameter, for the entrance, and continuing it the same size for one or two inches, then immediately widen it to about seven and a half or eight inches in diameter, and extend it about the same size to a depth of from eighteen to twenty inches, when it is finished. The chips they make in excavating it, except a

few of the finest, are mostly thrown out of the entrance on the ground, which reveals their nesting place.

In the few chips remaining in the hole the female makes a slight hollow, and lays from six to eight semi-transparent and highly polished white eggs. They measure $1\frac{1}{16}$ of an inch in length, by $\frac{7}{8}$ of an inch in breadth. While incubation is going on, the male, when he relieves the female from setting, flies to the tree and alights near the entrance, and emits the notes resembling in sound the syllables "flicker, flicker," and peeps around the tree at the entrance to see when the female leaves. On hearing him she quits the nest, when he immediately takes charge of the eggs until she returns. When the young are large enough they leave the cavity and creep to the top of the tree, locating themselves on different parts of it, and are fed by the old birds until they can fly quite well, when they are taken to the fields and pastures or woodlands, where they soon learn to provide for themselves. Although the usual number of eggs laid by these birds for a brood are from six to eight, yet they will sometimes lay a hundred, when they are taken from the nest as often as they are laid, leaving one for a nest egg. Trials have been made of the number of eggs they would hatch at one setting. A dozen of eggs were taken from the nest of one, and then the bird was allowed to lay the usual quota for a brood; then to these the number that were taken were added, and the bird commenced setting. In due time these eggs were hatched, and when the young birds were old enough to creep about the tree, it literally swarmed with young woodpeckers.

These birds suffer exceedingly from the depredations of the Mottled Owl. I seldom find the breeding-place of this owl without finding the wing-feathers of the woodpecker scattered about it in greater quantities than those of any other birds. They often alight upon the ground, and perch crosswise on a limb of a tree, a thing which other species of woodpeckers are not accustomed to do. The Downy

Woodpecker (*Picus pubescens*) is a no less interesting bird than the Golden-winged Woodpecker (*Colaptes auratus*). They are equally beneficial and much more familiar. They breed in the orchard and in the trees about our dwellings with as much confidence as in the forest, and visit us in all seasons of the year, and are especially welcome in winter.

This bird receives the opprobrious name of "sap-sucker," a reproach which none casts upon him but the ignorant, who condemn him as mischievous without investigation, and then wickedly execute their judgment without mercy. In the latter part of September, and in all the months of October and November, this bird enters the orchard and selects those trees which have the smoothest bark and are the healthiest, and begins to pick small holes about one-quarter of an inch in diameter, quite through the bark, and from half an inch to an inch apart, in parallel lines around the trunk of the tree, which circles of holes are from one to two inches above each other. These lines of holes are extended up the whole length of the trunk of the tree, and sometimes around the larger limbs diverging from it.

It is well known that some of the insects injurious to fruit trees deposit their eggs in the latter part of summer and in the autumn, laying them under the bark and in crevices about the tree, in fact in any secret place they find. As they ascend the tree, perforated by the woodpecker, they are not at a loss to find a suitable place for their purpose. If they pass the first, second, or third tier of holes, there are others above them as well adapted to their wants, and in them they may deposit their eggs, and cover them with a covering indestructible by the weather. Others find in them a retreat from daylight and from storms, and in them some other insects lie dormant, shrouded in their silken cocoons. In this we see the wisdom of the Creator who supplies the wants of all his creatures. He teaches the ant, the squirrel, and the bee, to hoard and gather for themselves a sufficiency of food for winter; but to the Downy Woodpecker he has

given quite a different instinct. He has taught it to be a hunter, and has taught it also to know the habits of its game, and when, and where, and how to set its traps. How often do we see in winter and early spring, the Downy Woodpecker followed by a troop of Chickadees, visiting every tree in the garden, especially those that have been perforated by itself, searching every hole and crevice for insects and their eggs. It shows no disposition to quarrel with its company, but rather seems to take pleasure in directing their course through the forest and orchard by the notes of its shrill clarion voice. It admits the Nuthatch and Brown Creeper to its society, who join it with the full assurance of its friendship, and they roam with it in storm and in sunshine over a vast territory, destroying in their course millions of vermin in the embryo state. The insect-eating birds that visit us in the spring and stop a few months, retiring in autumn, are very beneficial to the horticulturist, but their services are not to be compared to those of the resident birds which feed upon insects in every stage of their life.

The Downy Woodpecker perforates decayed trees, or their branches, for their nesting places. When they select a horizontal branch, as they often do, they make a cavity in the limb to the extent of from ten to fifteen inches, towards the trunk of the tree, having the entrance leading to it on the underside of the branch; in such cases their nests are difficult to find. When they select an upright branch, or the trunk of a tree, it is dug out to the depth of from eight to twelve inches, and in the bottom of the hole, on the chips left for the purpose, the female deposits four or six pure white eggs, which measure in length six-eighths of an inch, and in breadth five-eighths of an inch.

To show what diligent and persevering birds they are, I will state a fact. A pair of Downy Woodpeckers selected a branch of a chestnut tree, which was broken off about four feet from the trunk of it, and about ten feet from the

ground. In it the birds had determined to make their home and began their operations. It was a piece of wood dried and thoroughly seasoned, without the least sign of decay. In the first day's labor, which was chiefly done by the male, they succeeded in penetrating the limb about one and one-half inches. The hole was conical in shape, the outer circle being finished or made large enough to admit the birds; then it gradually tapered to the smallest point. The second day they commenced to beat out the hole of sufficient size and depth, which was slowly executed, as hardly a particle of wood could be seen to fly off before their bills; yet they persevered, and in eleven days they succeeded in completing it, by digging four inches below the aperture. Although it cost the birds much time to procure this tenement they had the satisfaction of knowing it was a good one. There was no smell of rotten wood about it, but was clean, dry, and smoothly finished. In this nest were reared five young woodpeckers. The male was mostly seen about the premises, and I think he did the most labor in preparing their abode. When the young appeared he was also diligent in procuring their food.

In winter the Downy Woodpecker sometimes digs a hole in some rotten tree for a retreat in stormy weather, and to roost in.

NATURAL CARVINGS.

BY PROF. A. M. EDWARDS.

Many of our readers have doubtless often admired and wondered at the exquisite carved ivory work sent forth by that strange, industrious, and ingenious people, the Chinese. No examples of their manipulative skill have attracted more attention, perhaps, than those balls within balls, each one more elaborately decorated than the other,

which, at one time, were by no means common out of China, and, therefore, brought very high prices. Of late years, however, the natural result of such a demand has been a plentiful supply, so that what were once rarities are now rather common ornaments in many houses. And although travellers in those foreign parts have come back and endeavored to dispel the mystery that has ever hung around these strange examples of a strange people, by telling us that they are not made from one piece of solid ivory, but carved separately and then moulded one over the other, yet they still remain objects of great interest and beauty.

What will the admiring collector say, however, when we tell him that there exist objects almost the counterpart of these Chinese ivory balls, the substance of which is glass-like, consisting of pure silica, or the same material as rock-crystal, but which are thus formed and fashioned by animals? And shall we increase his wonder by informing him that the beauty of these objects is very materially heightened by the fact that they are of minute dimensions, so small in fact, that they can only just be seen by the unaided eye, but when examined by sufficiently powerful magnifying glasses, exhibit a much greater variety of contour and sculpture than even the most fantastically formed oriental handiwork! These are known to scientific observers as *Polycistineæ*, and it is our intention to say a few words respecting these objects, concerning whose life-history, it is true, very little is known, but which form beautiful subjects for examination by means of the microscope.

In Plate 7 are represented a few of the many varied forms presented by the Polycistineæ, and what is with certainty known concerning them, we give as follows. First, however, so as to make the subject readily understood, we must say something with regard to two other classes of very simple animals, which, in the modern system of classification, are placed first in the list. These are the *Gregarinida* and *Rhizopoda*.

The *Gregarinida*, so called from a Greek word meaning a flock, on account of the mode of congregating together which these creatures possess, "are among the simplest forms of animal life of which we have any knowledge. They are the inhabitants of the bodies of other and larger creatures, and are commonly to be found in abundance in the alimentary canal of the common cockroach, and in earth-worms. They are all microscopic, and any one of them, leaving minor modifications aside, may be said to consist of a sac, composed of a more or less structureless, not very well-defined, membrane, containing a soft semi-fluid substance, in the middle, or at one end, of which lies a delicate vesicle; in the centre of the latter is a more solid particle." This is the whole of the anatomy of these creatures, no mouth nor organs of any kind being apparent, so that they are placed at the point where it may be said that animal life dawns.

Next to the *Gregarinida*, in the scale of being, stand the *Rhizopoda*. "It seems difficult to imagine a state of organization lower than that of the *Gregarinida*, and yet many of the *Rhizopoda* are still simpler. Nor is there any group of the animal kingdom which more admirably illustrates a very well founded doctrine, and one which was often advocated by John Hunter, that life is the cause and not the consequence of organization; for, in these lowest forms of animal life, there is absolutely nothing worthy of the name of organization to be discovered by the microscopist, though assisted by the beautiful instruments that are now constructed. In the substance of many of these creatures, nothing is to be discerned but a mass of jelly, which might be represented by a little particle of thin glue. Not that it corresponds with the latter in composition, but it has that texture and sort of aspect; it is structureless and organless, and without definitely formed parts. Nevertheless it possesses all the essential properties and characters of vitality; it is produced from a body like itself; it is capable of assim-

ilating nourishment, and of exerting movements. Nay, more, it can produce a shell; a structure, in many cases, of extraordinary complexity and most singular beauty." With the *Rhizopoda*, however, we have not to do at present; at some future time we shall take the opportunity of presenting our readers with some figures illustrating the grace exhibited in some of their hard tissues, or skeletons, as we may rightly term them.

Our Polycistineæ belong to a class of animals very nearly allied to those we have just been speaking of, and named by naturalists *Radiolaria*. This name has been given to them on account of the radiating arrangement of their parts, such parts being grouped, generally, around a common centre. These simple forms of life consist of microscopic masses of the semigelatinous substance we have already spoken of, and which is known as sarcode, meaning matter, as it were, on the way to become flesh, or protoplasm, from words designating the first form of matter. This term, however, is more commonly applied to the primitive tissue of the embryo or egg, out of which all subsequent organs are formed by a peculiar process, termed differentiation. From this mass of sarcode, constituting the whole mass of the animal proper of the Radiolarian organism, are protruded filaments, which are often extremely long and slender, and have been named *pseudopodia*, from two words meaning false feet; for these projections act as feet to the creature which throws them out, serving not only as organs of propulsion but to secure its prey and convey its food into the position for assimilation, and the building up of new tissues. This sarcode is such a peculiar kind of substance that the pseudopodia, as they are thrown out, may remain single or unite so as to form reticulations, or even coalesce into one mass around any particle of nutrient matter which they come in contact with. Scattered throughout it, generally, are to be found numerous yellow corpuscles, which multiply by fission, as it is called, or division, and to these parts a skele-

ton may be added, consisting merely of fine pin-like masses, or spicula, and these may be loose or united into a solid shell of great beauty of form and sculpture, as our Plate shows, or the skeleton is an assemblage of stout rods meeting in the middle of the creature, where a sac is found, and pointing in all directions. Here we see the applicability of the name given to the class of Radiolaria. No reproduction, by means of a true sexual process, has been as yet observed in any Radiolarian, and therefore here is opened a very promising and attractive field of research for the naturalist.

For the most that is known of the Polycistineæ, in their living condition, we are indebted to Prof. Müller, a celebrated German naturalist; but their remains, or shells, which are preserved in certain rocks in different parts of the world have been investigated and figured by the great microscopist of Berlin, Ehrenberg. He first discovered them in the mud brought up from the bed of the river Elbe, at Cuxhaven, and afterwards he found them in similar collections made in the antarctic seas. Prof. Bailey, one of the first and most enthusiastic American naturalists, also observed them, accompanied by other organisms, both animal and vegetable, in soundings, brought up by the lead from the bottom of the Atlantic Ocean, at depths of from 1000 to 2000 fathoms. So, also, the sea-bottom which has been procured from the Gulf of Mexico, off the coast of Florida, in some quantity, by means of a peculiar apparatus specially constructed for the purpose, is seen to be extremely rich in some of the more exquisite forms of these glassy shells. The microscope has thus revealed the existence of an universe of life at the bottom of the ocean. Of course the soundings made previous to the laying of the Atlantic Telegraph cable told the same story; here, as elsewhere, the sea-bed is overlaid with a carpet of the silicious remains of these beauteous atoms. During some past geological periods, however, it would seem that the Polycistineæ existed in much greater numbers than at the present time, for certain strata of con-

which, at one time, were by no means common out of China, and, therefore, brought very high prices. Of late years, however, the natural result of such a demand has been a plentiful supply, so that what were once rarities are now rather common ornaments in many houses. And although travellers in those foreign parts have come back and endeavored to dispel the mystery that has ever hung around these strange examples of a strange people, by telling us that they are not made from one piece of solid ivory, but carved separately and then moulded one over the other, yet they still remain objects of great interest and beauty.

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siderable thickness are found, on examination, to be made up almost entirely of their silicious skeletons. Thus in the chalks and marls of Sicily and Greece, Ehrenberg detected vast numbers of forms; and at Oran, in the north of Africa, is an extensive stratum made up of the remains of Polycistineæ and similar organisms, both animal and vegetable. The famous infusorial strata of the States of Virginia and Maryland on our Atlantic coast, and of California on the Pacific, have, mixed with the minute plants known as Diatomaceæ, many very fine species of Polycistineæ, as well as the remains of sponges. The most remarkable deposit, however, of this character is that which makes up the greater part of the island of Barbadoes. This rock is, in many places, almost entirely formed of these glassy shells. The materials which led to this discovery, in the year 1846, were furnished by the geological researches of Sir. R. H. Schomburgh, hence one of the most beautiful species has been named after him.

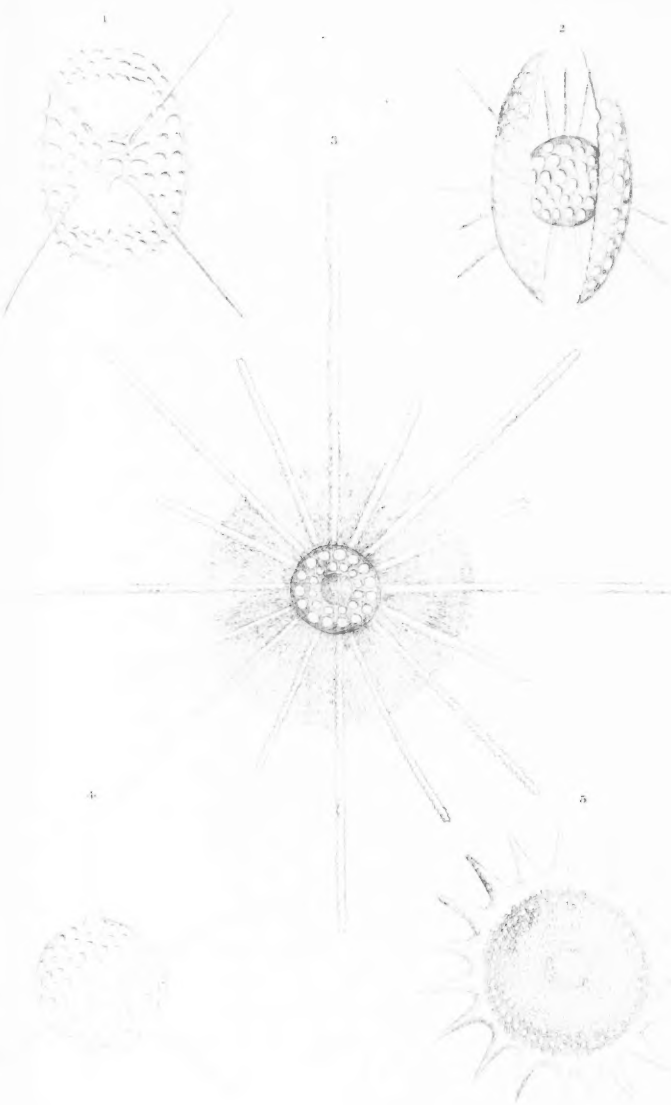
The variety of form and outline which the Polycistineæ assume is very great, and always of great beauty and grace, while their minute dimensions make them, if possible, still greater sources of admiration to the student of nature who thus finding strata of rocks, of considerable thickness, made up of their delicate remains feels the truth of the words of the poet, when he says—

"The dust we walk upon was once alive."

REVIEWS.

THE METAMORPHOSIS OF CRABS.*—That insects undergo a metamorphosis was known by the ancients; the discovery that crabs and worms undergo a true metamorphosis, scarcely less striking than that of insects, is not more than thirty years old. The Nauplius form, here figured, was known to naturalists in the days of O. F. Müller (who wrote a

* Fur Darwin. Von Fritz Muller. With sixty-seven woodcuts. Leipzig, 1864. 8vo, pp. 91. Also recently translated and published in London by Van Voorst.



work on Crustacea in 1785) and was known to be the young of the little Cyclops and Cypris, which swim in fresh water and tidal pools; and the strange Zoëa was made known in 1802 by Bosc, who described it as an Entomostracan under the name of *Zoe pelagica*. That, however, the Zoëa was simply a young crab was shown by J. V. Thompson, in 1836, and that the earliest stage of the shrimp began with a Nauplius form is a still more recent discovery, and so remarkable in its bearings on the classification of the Crustacea, and the philosophic study of the Crustacea generally, that an explanation of how crabs and shrimps grow may be welcome to our readers. For a summary of the facts here presented we are especially indebted to Fritz Müller's "*Für Darwin*," a book called forth by Darwin's Origin of Species, and written by a strong and able advocate of developmental views, and which has just been translated into English by Mr. Dallas. We have often watched the Nauplius of the water fleas, Cyclops, etc., swimming about in a small fresh water aquarium, when they closely resemble young mites. Indeed the spiders (Arachnida) seem in the young of their degraded forms to mimic wonderfully the young of the Crustacea, so that the two forms would seem at a casual glance, hardly to belong to different genera, and it is a most significant fact that these two great groups seem to run into each other here, so that their limits seem indistinguishable, and we only know that one is a young spider and the other a young shrimp by tracing their life history farther on. Again, the border land of the Crustacean world and the spider world fade insensibly into each other when we have before us a Pycnogonid or Sea-spider, and a Harvest-man for example, and it is only by going up the scale, and by intermediate forms tracing the relationship of the one to the crabs, and of the other to the true spiders, that we realize that the two worlds seem to touch

Fig. 72.

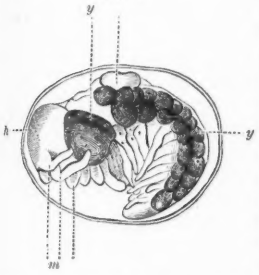
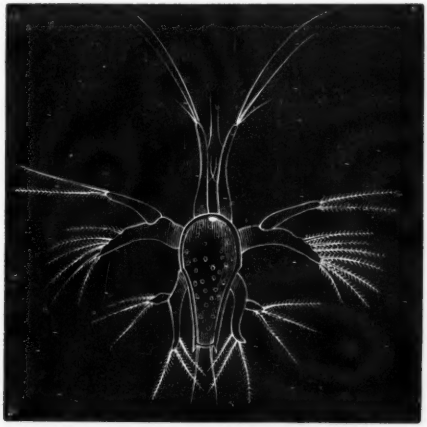


Fig. 73.



at only a single spot, and that even then the contact is not real. In fact the Nauplius is a larva, and as the insect world seems to touch upon the worm world when a caterpillar or dipterous larva is before us, so the larva of the mite and the larva of the crab assume a common form, though potentially so divergent. It is only a partial view that would unite the Arachnids with the Crustacea because of the identity in form of their larval stages, or of certain degraded forms. Among insects we do not know the Stylops alone by the Sac-like female scarcely more highly organized, so far as externals go, than the Peltogaster, but consider also the active, highly organized, male Stylops, a being so widely divergent in external form from its mate, and though the difference is only sexual in its nature, yet reaching almost as far as the difference between classes in the animal kingdom.

Fig. 74.

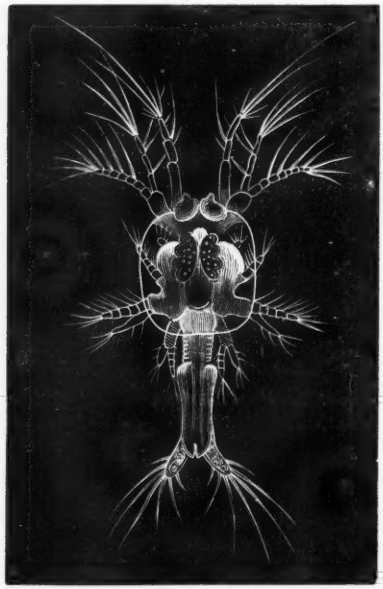


Fig. 72 represents an embryo of a Corophium, magnified ninety diameters; the mouth-parts are similar to the legs in form. The yolk mass (y) lies on the back of the animal; h is the head, and m the mouth-parts.

Fig. 75.

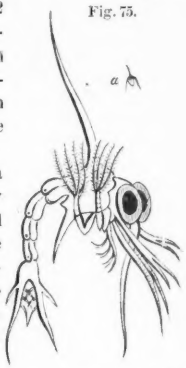


Fig. 73 represents the larva, or "Nauplius," of a shrimp, magnified forty-five diameters. The body is soft, oval, in form somewhat like a mite, and with three pairs of short thick legs, of which the front pair are simple, ending in long simple bristles, while the two hinder pairs are divided into two portions, each bearing two or more spinulated bristles; and the end of the body is square, with two bristles.

After moulting this skin the animal acquires a pair of jaws and the fore and middle pair of foot-jaws; the body is much larger and the front part is greatly enlarged and protected by the shield-like head-thorax, which is now distinct and rounded in form. As the number of feet have

become more numerous, they are smaller than before, and the anatomy of the internal organs is more complex. At the end of the body, now much elongated, is a pair of short feet, ending in several bristles. This is the Zoëa stage (Fig. 74, enlarged forty-five diameters) and corresponds to the Zoëa of the Crab, *Carcinas mœnas* (Fig. 75; *a*, natural size), discovered by Thompson.

THE CANADIAN ENTOMOLOGIST completed its first volume in July. The Editor, Rev. C. J. S. Bethune, Credit, Canada, announces that the publication will be continued and the number of pages of each number be increased from eight to at least twelve, and, if sufficiently encouraged, to sixteen, while the annual subscription will be increased from 50 cents to $1.00. We hope this journal will be sustained, for it is a credit to Canadian entomology.

THE AMERICAN ENTOMOLOGIST.—The August number, which comes to us in an attractive cover, is the last of Vol. i. The Editors announce that hereafter each number will consist of thirty-two pages instead of twenty-four, and the annual subscription has been raised from $1.00 to $2.00. The present number abounds with illustrations, while the paper is improved in quality. The magazine cannot fail to satisfy those who wish for information regarding our noxious and beneficial insects.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The Eighteenth Annual Meeting of the Association was held August 18-25, at Salem, Mass. From the great number of papers presented, their high scientific character, and the large number of members present, the meeting was judged by many to have been, both in a scientific and social point of view, the most brilliant and successful one that has been held for many years. About two hundred and seventy-five members were present and one hundred and sixty-three papers were presented. A great deal of business was dispatched, and the legitimate objects of the Association so closely adhered to that invitations from various societies in Boston and Cambridge, the city authorities of Boston, and other places, were reluctantly refused in order that each paper should have a hearing. One day (Saturday) was given up to the enjoyment of a steamboat excursion about Massachusetts Bay, given by the city of Salem.

This meeting was signalized by the formation of two new subsections of Section B, viz.: *Archæology* and *Ethnology;* and *Microscopy*.

There was also held during the session a microscopic convention which proved very successful and interesting to microscopists, and as the standard of instruments made in the United States is not surpassed by those

of England, France or Germany, we hope this section will continue to flourish and increase in influence and importance, and stimulate our manufacturers of microscopes, and observers, to still greater perfection in the construction and use of this instrument. As a Natural History journal we are not called upon to report the doings of Section A, Mathematics, Physics and Chemistry, but we should say that its meetings were this year especially interesting from the numerous papers on the recent eclipse which were presented.

The American Association dates its origin as far back as 1840, when some eighteen gentlemen, connected with the geological surveys then in progress, met in the hall of the Franklin Institute, Philadelphia, and organized an association under the name of "The Association of American Geologists." At the meeting held in 1842 the name was changed so as to read "The Association of American Geologists and Naturalists," and in 1847 its sphere was enlarged and its present name adopted; thus embracing every department of science.

The meetings were suspended during the years 1861–65, but since the war they have increased in value and the number of those in attendance, and both this and the last meeting have demonstrated that the American Association fully accords with the genius of our people and institutions, and that as promoting good fellowship and harmony among scientific men, and placing them in a more direct relation with the people, the value of these annual reunions cannot be too highly estimated.

An important change in the Constitution was proposed, which, if adopted at the next meeting, will greatly facilitate business, and will place all the Sections on an equal footing. The change proposed is as follows: Rule V to read—

"The Association shall be divided into *two* sections, A and B. Section A to be divided into the following subsections: 1, Mathematics and Astronomy; 2, Physics and Chemistry; 3, Microscopy. Section B into the following: 1, Geology and Palæontology; 2, Zoölogy and Botany; 3, Archæology and Ethnology. The two sections may meet as one."

It was voted that the next meeting be held at Troy, N. Y., on the first Wednesday in August.

Officers present at the Meeting: J. W. FOSTER, *President;* F. W. PUTNAM, *Acting Permanent Secretary;* O. C. MARSH, *General Secretary;* J. W. FOSTER, F. W. PUTNAM, O. C. MARSH, B. A. GOULD, LOUIS AGASSIZ, JOSEPH HENRY, BENJAMIN PEIRCE, JOHN TORREY, T. STERRY HUNT, J. S. NEWBERRY, ALEXIS CASWELL, W. C. KERR, *Standing Committee.* (Messrs. ROOD, LOVERING, ELWYN, ROCKWELL and WHITTLESEY were absent.)

Section B. (Natural History)—Prof. L. AGASSIZ, *Chairman;* Prof. T. STERRY HUNT and Rev. G. A. LEAKIN, *Secretaries.* Subsection C. (Archæology and Ethnology)—Dr. E. G. SQUIER and Prof. ARNOLD GUYOT, *Chairmen;* WILLIAM H. DALL, *Secretary.* Subsection D. (Microscopy)—J. E. GAVITT, *Chairman;* E. BICKNELL, *Secretary.*

PAPERS READ IN SECTION B.—NATURAL HISTORY.

On two New Genera of Extinct Cetacea. By *E. D. Cope.*
On the Early Stages of Brachiopods. By *E. S. Morse.*
On the Discovery of the Ammonoosuc Gold Field. By *Henry Wurtz.*
The Ammonoosuc Gold Field in New Hampshire and Vermont. By *C. H. Hitchcock.*
The Gems of the United States. By *A. C. Hamlin.*
On the Laws which Govern the Production of Sexes in Plants. By *Thomas Meehan.*
On a Remarkable Locality of Vertebrate Remains in the Tertiary of Nebraska. By *O. C. Marsh.*
On American Phyllopod Crustacea. By *A. E. Verrill.*
Note upon the Palæotrochis. By *Henry Wurtz.*
On the Homologies of the Palæchinidæ. By *Alex. E. R. Agassiz.*
Remarks on Trichina spiralis. By *J. Baker Edwards.*
On the Plumage of Terns. Communicated by Miss GRACE ANNA LEWIS.
On Norite or Labradorite Rock. By *T. Sterry Hunt.*
On the Geology and Geography of a part of the coast of Maine. By *John Johnston.*
On the Nature of Glands in Acacia and Cassia. By *Thomas Meehan.*
On the Valley of the Amazon. By *James Orton.*
Distribution of Coal, Iron, and the Precious Metals in China. By *A. S. Bickmore.*
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Mr. THOMAS MEEHAN read a paper "On the Laws which govern the production of sexes in Plants." At a previous meeting he showed that extra vigor or vitality was accompanied by a greater cohesion or adnation of the leaves of coniferæ with the stems. Similar laws, it seemed probable, governed the production of the sexes in plants. The female flowers of Norway spruces were always on the most vigorous branches; male flowers only on weak branches. As the strong ones become weak they lose the power of producing females and produce males only. But the Larch afforded the best illustration. As shown last year the most vigorous shoots have the leaves adherent with the stems. What we call leaves are only foliaceous awns. The true leaves only appear when the axial growth is arrested, the verticils or spurs bearing the true leaves. When the reproductive age commences the Larch can only bear flowers from these weakened spurs; only the strongest of these produce female flowers, and only after two or three years of weakening process, by the shade afforded by the increased growth of branches, do the male flowers appear. So low is vitality when these male flowers appear that with their production the whole spur dies. The long, dead, warty strings on Larch shoots are what have been male flowers. The same law can be traced more or less through all *Coniferæ*. In *Amentaceæ* the same law, only in another form, prevails. In *Quercus, Juglans, Carya*, and others, male flowers appear with the opening leaves of spring, evidently formed during expiring vegetative force the fall before: the female only after growth has grown vigorously on the apex or culmination of the greatest vigor. In *Corylus, Carpinus*, and allies, the male flowers were also on the weakest parts. There were in some plants several *waves* of growth in the most

vigorous shoots; for instance *Pinus inops*, *P. pungens*, *P. mitis*, *P. rigida*, and some oaks. In these cases the first wave was the most vigorous, the last the weakest, but the female flowers are not on the apex of the shoot, but on the apex of the *most vigorous wave*. The *Cyperaceæ* afforded similar illustrations. Vigor is only one form of high vitality. Power of endurance is another. The Norway spruces, and those species generally which were the hardiest individually, or in comparison with other species, had greater powers to produce female flowers. Not so easily seen, but yet evident was the law in hermaphrodites as in monœcious plants. In many hermaphrodites there was known a tendency to become unisexual, sometimes in the male, sometimes in the female direction. A general debility follows the male in such cases, and increased vitality the female. *Viola*, *Fragaria*, and other instances were given in favor of the latter point, and double flowers, variegated plants, etc., as instances of degeneracy to male weakness. The conclusion drawn from the facts given was, not to establish the theory, but to excite investigation whether it was not *the highest types of vitality only which take on the female form?* He concluded with the bare suggestion that the same laws might prevail in the animal world.

He also read a paper "On the Nature of the Leaf-glands in *Cassia* and *Acacia*." Dr. Asa Gray says in the fifth edition of the "Manual" that the glands on *Cassia Marilandica* are near the base of the petiole. This is true only of the upper leaves. In the lower the position varies from near the base up to the first pair of leaflets. This shows it is not a part of the leaf system as it then would have its regular position. It *must be an accident*. In a neighboring genus (*Gleditschia*) we find two buds are formed above each leaf; the one axillary, the other just above, and usually forming a stunted branch or spine. The lower bud produces the growing shoot. In another allied genus, *Gymnocladus*, two or *three* buds are formed one above another, very few of which ever push at all, but when this does take place, it is only the *upper bud* which forms a shoot. The *lower bud* is generally about the centre of the dilated base of the petiole. Thus we have a class of allied plants, with two or three buds one above another, in some cases two inclined to push freely, although one as a spine (as in *Gleditschia*), the lower as the shoot; in another, as in *Gymnocladus*, scarcely pushing at all, and rather absorbed by the stem; but when pushing at all, the *upper one*, and on the other side of *Gleditschia*, *Cassia*, *Acacia*, etc., with the lower bud *absorbed by the petiole, and thus forming the gland*.

W. H. Dall read a paper "On the distribution of the native tribes of Alaska, and the adjacent territory." After reviewing the works of Baer, Wrangell and Holmberg, Mr. Dall proposed a new classification, the revision being based on new information obtained during personal exploration by himself and his companions.

The North American natives are divided into two great groups, Indians, and, another for which there being no general term, he proposed

the name Orarians (from *ora*, a coast), in reference to their universal coastwise distribution.

Various points of interest in regard to the several tribes were noted, and their comparative relations were shown by a table of twenty-four dialects, and a colored map showing their geographical distribution.

Prof. ALBERT S. BICKMORE read a paper "On the Distribution of Coal, Iron, Mercury, Tin, and the precious metals, in China. Prof. B. showed that coal occurs from place to place over the whole of China proper, and that iron is found in the north of China, especially in the Province of Shansi, where the ore is obtained from which the steel used in the manufacture of razors, knives, etc., is made. Mercury, or "Water-silver" as the Chinese call it, occurs in Shansi in small quantities. Tin is reported from various localities. Petroleum was not only known but used in lamps more than 160 years ago. The Chinese name for it, "Oil of Stone," is identical with ours.

Prof. C. H. HITCHCOCK stated in his paper "On the Ammonoosuc Gold Fields," that this area begins near Bellows' Falls, and extends into Canada, following the Merrimac river. It was at first referred to the Quebec group, but he thought the rocks distinct. The gold was found in 1864 in the rocks, by Mr. Henry Wurtz, at Lima, N. H. The rock is a black clay slate, with quartz veins containing iron pyrites, ankerite and galena.

Dr. C. C. PARRY in his paper "On the Rocky Mountain Alpine Region," stated that the wooded belt of coniferous trees begins by a somewhat scattering growth near their base at an average elevation of six thousand feet above the sea. This belt acquires its densest growth, and exhibits the greatest number of distinct species, at an elevation of between 7000 and 9000 feet, and terminates by an abrupt well-marked line, at an average height of 11.300 feet.

The limit of upright tree growth is marked with a singular abruptness. He explained this by supposing that the so called timber line marks the extreme point of minimum winter temperature, below which no exposed phenogamous vegetation can exist. All that survives above this point does so by submitting to a winter burial of snow, beneath which protecting cover it is enabled to maintain its torpid existence. The usual characters of alpine plants, here as elsewhere exhibited, consist in a dwarfed habit of growth, a late period of flowering, and early seeding, the forms being almost exclusively perennial.

The alpine flora is represented by thirty-four natural orders, of which thirty-one belong to phenogamous plants, the remaining three include the higher orders of Cryptogams; of the latter the ferns are represented by a single species (*Cryptogramna acrostichoides* R. Br.), not exclusively alpine. Mosses are numerously represented, but are still comparatively rare, while lichens are most abundant and afford the greatest number of species.

The alpine area lying between the thirty-seventh and forty-first parallel of latitude, is from 1200 to 1500 square miles in extent. As a sani-

tary retreat during the summer months it is unexcelled in the purity and coolness of its atmosphere, the clearness of its flowing streams, and its picturesque, extended views.

Prof. E. D. COPE, in his paper "On the Larval Characters of the Urodela," stated: 1st, That it is shown that one portion of the primary groups is inexactly parallel to larvel stages of the other portion. 2d, That certain genera only fail of exact parallelism with larval stages of other genera by but two characters. 3d, That others lack but one character; and 4th, That others present an exact parallelism.

He had reason to think from the development of Amblystoma, and experiments on salamander and frog larvæ, that the process of growth or assumption of generic characters may be much retarded or accelerated. Such a process would produce the cases of exact parallelism; and if the retardation in the character should continue, would necessarily soon result in inexact parallelism in that respect, thus producing a complete metamorphosis of the genus. The reverse of this process is acceleration, and expresses the mode of progress of a type to its highest development in time history, while the retardation is the mode of its degradation.

Mr. HYATT remarked that Prof. Cope's views were, so far as the law of acceleration was concerned, equally good among the shell-covered Cephalopods. Among these animals the shells of the species displayed the action of this law. He quoted from a previous publication in the "Memoirs of the Boston Society of Natural History," in which this law had been distinctly stated. But farther than this that its action was also as forcibly displayed in the species itself as in the genus.

Mr. A. HYATT read a paper "On the Homologies and General Structural Relations of the Polyzoa." The Embryology of the Hypocrepian Polyzoa show that Loxosoma is the lowest of all in the order, and together with Pedicellina form the lowest suborder of the group. The progress of the whole order of Polyzoa is from this permanently invaginated form through intermediate stages to Cristatella, in which, when the polypide is inserted, even the stomach is carried up beyond the orifice of the cell. Thus the progress of structure is from an animal in which all the organs are crowded into the anterior end, into the cœnœcial system, and to one in which the cœnœcial or reproductive, evaginatory or gastric, and the lophoric or neural systems are all distinct when the animal is exserted.

The Polyzoön may be transformed into a Brachiopod by simply enlarging the cœnœcial wall and carrying it over, inclosing the lophophore and reversing the position of the arms. Thus both the Polyzoa and the Brachiopods may be defined as sacs, closed at the posterior end by discs surrounded by tentacles, and perforated by an edentulous mouth, from which hangs the alimentary canal in the antero-posterior axis of the sac. The whole plan of the Mollusca was stated to be that of a simple sac, and the term Saccata proposed as more appropriate than that of Mollusca. The objection that the whole animal kingdom may be said to be sac-like

has been raised. The Radiata are, it is true, radiated sacs, the Articulata ringed sacs, and the Vertebrata sacs divided by the vertebral axis, but the Saccata are typically sacs.

Prof. THEO. GILL, in his communication "On New Species of Fishes obtained by Prof. Orton in the Valleys of the Maranon and Napo," concluded from the study of twenty-five species collected by Prof. Orton, that there were no distinct fish faunæ in these river valleys, species of the same genera having been found distributed through them, some of the genera having also occurred lower down the Amazon, while one genus inhabited the fresh waters of Central America.

Dr. T. STERRY HUNT, in his remarks "On the Geology of North-eastern America," exhibited a new geological map of the British Provinces, and of the United States as far South as Virginia, and West to near the base of the Rocky Mountains. He called attention to the uncolored portion represented by New England, and to the fact that less was known of the age of the rocks of that region than any other. He stated that he knew of no eruptive granitic rocks, but that with an occasional exception they were of sedimentary origin. Metamorphism depends on the original quality of the sediments; we cannot produce granite from sandstone, or dolomites from limestones, etc., etc. He cited a case observed in New Brunswick where the Dadoxylon sandstones are overlaid by granitoid and felspathic grits, and yet the Dadoxylon sandstones are unaltered. On lithological grounds he thought that the rocks about Lowell and Newburyport, containing thick beds of limestone, were of Laurentian age, and having seen specimens of Labradorite, from boulders in Marblehead, in the Museum of the Peabody Academy, he suggested that there might be Laurentian rocks about Salem.

Messrs. MATTHEW and BAILEY, in their "Remarks on the Age and Relations of the Metamorphic Rocks of New Brunswick and Maine," after giving a summary of the labors of Gesner, Robb, Matthew, Dawson, Hitchcock, Bailey and Hartt in this region, describe the Laurentian, Huronian (or Cambrian), Lower and Upper Silurian rocks, and give a detailed description of that portion of the metamorphic area not occupied by the rocks above mentioned. This portion consists of Upper Devonian strata and granite, of which the latter forms, in New Brunswick, a ridge of variable width, having Devonian slates on both sides. The two together probably occupy three-quarters of the metamorphic country south of the New Brunswick coal-fields.

Two principal divisions of this series may readily be distinguished, on the south side of the granite ridge, viz.: (1) the Lepreau, comprising diorites, felsites, and conglomerates in its lower portions; and in the upper subdivision gray sandstones, black slates, and the Dadoxylon sandstones. To the lower division, viz.: (2) the Mispeck division, belong, in the lower subdivision, conglomerates and diorites, Cordaite, fine-grained slates and orthophyre; and in the upper subdivision conglomerate and slate, granitoid grit, talcoid (?) slates and limestone. At the base of

these rocks lie the granite rock, and there appears to be a gradual passage from true granite, through felsites, to undoubted Upper Devonian slates, these Nerepis granites being probably altered sandstones and grits at the base of the Upper Devonian series. The rocks south of the granite ridge were littoral, and those on the north were deposited in deeper waters, the rocks being much more uniform. In the partially metamorphic slates of the Lepreau division, plants and shells characteristic of the Upper Devonian have been found, and when more highly altered, well defined crystals of staurotide, andalusite and garnet.

Having unexpectedly found that the greater part of the metamorphic country in New Brunswick, near the United States border, is of Upper Devonian age, the authors offered some suggestions and conjectures on the probable age of the schists, granites, etc., in the south-eastern half of Maine.

The granite ridge of southern New Brunswick enters the State of Maine at Calais, and is there represented by a thick body of conglomerate gneiss (composed of dark sienitic pebbles, from two inches to as many feet in diameter, enclosed in a white granitic, often porphyroid matrix), dark sienitic gneiss and white granite, which they believed to be Laurentian, and a mass of red, weathering, coarse granitoid rocks, which may represent those of the Nerepis, and perhaps constitute the basal portion of the Devonian. Both of these are probably represented in the granitic district of south-eastern Maine. To the eastward of this we appear to have chiefly Upper Devonian rocks, with occasional bands of upturned Upper Silurian rocks. The "traps" of this area correspond to the diorites, etc., at the base of the Mispeck division, and the red jasper to the red felsites and orthophyre above them. It is probable that the Lepreau divisions will be but meagrely represented, and the upper half of the Mispeck wanting in this tract, such being the case around the Passamaquoddy Bay.

On the north-west side of the granite ridge noted, we again meet in New Brunswick the Upper Devonian slates, now in their pelagic aspect. On the Maine border above Baring these consist of finer gneiss and micaceous quartzite, the former dipping towards and abruptly meeting the gneiss conglomerate, above alluded to, within which, along the line of junction, small pieces of the Devonian gneiss are imbedded, as though fragments of the latter had sunk in the pasty mass. Farther north these Devonian beds are folded and dip northward, passing beneath a heavy body of fine greenish and grayish micaceous slates, which here represent the Cordaite shales, or Lower Mispeck beds.

A similar arrangement is indicated by Prof. Hitchcock, who represents the slates or schists north of Baring as lying in a basin between the granite ridge above named, and another which crosses the northern part of Washington County and is supposed to connect through the northern part of Hancock County with the granitic masses around Mount Desert on the coast. On the southern side of this last granitic ridge, and form-

ing the northern side of the trough, are a series of beds described as quartz rock and calciferous mica schist, and which are said to be the same as those known to extend through York County, N. B., towards the Bay de Chaleur. This belt of rocks has been recognized, with essentially the same features, by Mr. Bailey on the St. John River above Fredericton, and about Grand Lake in the eastern Schoodic region in Maine.

The granites on the north side of this basin are overlaid by a gray gneiss holding bands of micaceous quartzite, which constitute the first rocks seen on the northern slope of the granitic mass. These may be the "argillo-micaceous schists," described by Prof. Hitchcock as holding a similar position in Maine and which are said to extend in an "essentially unaltered form to the Saco River."—in fact nearly reaching the south-west corner of the State. At this end of the basin, where probably the lower beds are exposed, the rock contains garnets, staurotide and kyanite. Along the north-east side (in Northport) it holds andalusite. If these rocks represent here the Lower Lepreau series, as the mica schists, holding a similar position and containing the same minerals, do in the central parts of Charlotte County, the geology of this portion of the Province will be greatly simplified.

There is a belt of granite associated with masses of obscurely stratified gneiss and beds of pyritiferous mica-schist extending along the Coast of Maine from Portland eastwards to the mouth of the Penobscot River, which, as described in Prof. Hitchcock's Report, resembles the Laurentian series of New Brunswick. With this exception, and possibly that of the belt of slates and quartzites which skirts the southern edge of the northern granite belt, nearly all the formations of south-eastern Maine might, on lithological grounds, be compared with those of the Upper Devonian series. Among these, however, may be islands or ridges of older rock, as is probably the case at some points along the eastern border.

Prof. E. D. Cope, read a paper "On two New Genera of Extinct Cetacea." His observations embraced a description of the characters of a very large representative of the Dugong of the modern East Indian Seas which was found in a bed, either Miocene, or Eocene, in New Jersey. It was double the size of the existing Dugong, and was interesting as adding to the series of Asiatic and African forms characteristic of American Miocenes. Another type was regarded as remotely allied to Squalodon, but it was edentulous, and furnished with a broad shallow alveolus, either of a form left after shedding a tooth, or that adapted to a broad obtuse tooth. It constituted a remarkable new genus which was called *Anopolonassa forcipata*. It was found in post pliocene beds near Savannah. He also exhibited teeth of two gigantic species of Chinchilla which had been discovered in the small West India island of Anguilla, which has an area of about thirty square miles. The specimens were taken from caves and were thought to indicate post pliocene age. With them was discovered an implement of human manufacture, a chisel made from the lips of a shell, *Strombus gigas*. The contemporaneity of the fossils and human

implements was supposed, but not ascertained. Its interest and connection with human migrations were mentioned; also the supposition of Pomel, that the submergence of the West India Islands took place since the post pliocene period.

Prof. O. C. Marsh described a "remarkable locality of Vertebrate remains in the tertiary of Nebraska." The locality described was the Antelope Station on the Pacific Railroad in South-western Nebraska. While engaged in sinking a well at that place in June, 1868, a layer of bones was found by the workmen at a depth of sixty-eight feet below the surface, which were at first pronounced to be human, but, during a trip to the Rocky Mountains, Prof. Marsh examined the locality and the bones, and found that the latter were the remains of tertiary animals, some of which were of great interest. The well was subsequently sunk about ten feet deeper. An examination proved that among them there were four kinds of fossil horses, one of which he described in November last as *Equus parvulus*. Although it was a full-grown animal it was not more than two and one-half feet high. It was by far the smallest horse ever discovered. Of the other kind of fossil horses one was of the Hipparion type, or the three-toed horse. Including the above the number of species of fossil horses discovered in this country was seventeen, although the horse was supposed to be a native only of the old world, and was first introduced here by the Spaniards. Of the other remains there were two carnivorous animals, one about the size of a lynx and the other considerably larger than a lion—twice as large as any extinct carnivora yet discovered in this country. Among the ruminants found in this locality was one with a double metatarsal bone, a peculiar type, only seen in the living musk deer and in the extinct anaplotherium. There were also the remains of an animal like the hog, a large rhinoceros, and two kinds of turtles. These, together, forming fifteen species of animals, and representing eleven genera, were all found in a space ten feet in diameter and six or eight feet in depth. It is supposed that the locality was once the shores of a great lake, and that the animals were mired when they went down to the water to drink.

Prof. W. P. Blake read a paper "On the Plasticity of Pebbles and Rocks." He presented some fresh evidence from a conglomerate in Arizona Territory. This conglomerate consisted of a paste of micaceous schist, filled with pebbles of varying size, and elongated and compressed similar to those of the Newport conglomerate. They presented even more conclusive evidence of having been drawn out, and compressed by tension and enormous pressure, than even the Newport pebbles. Eminent geologists had alleged that deep seated rocks often became plastic and that those not much exposed to air were softer than those on the surface. Prof. Blake then adduced arguments and facts tending to substantiate this theory. The distortion of hard rocks was found on a large scale in the flanks of the Sierra Nevada of California. Prof. Blake said that the consideration of the phenomena led him to conclude that enormous and long

continued pressure and tension probably at a moderate elevation of temperature (but not necessarily so) had been sufficient to produce the molecular movement of these hard and apparently unyielding materials. Mechanical force alone appeared to have been the agent, and M. Tresca had shown that under enormous pressure solids could be made to flow in the same manner as liquids, or that in their movements they followed the same law. By the careful study of these phenomena of plasticity new views were opened of the structure of great rock masses; of the phenomena of plication, lamination; and of the origin of some structural peculiarities of mineral veins and their enclosing walls. In view of all the facts, Prof. Blake thought that geologists should admit that very great changes had been produced in the structure of rock masses by simple mechanical pressure, unaided by any great elevation of temperature or by extraordinary chemical agencies.

Prof. O. C. Marsh read a paper "on some new Mosasauroid Reptiles from the Greensand of New Jersey." The striking difference between the reptilian fauna of the Cretaceous period of Europe and the same period in America was that in the former there were great numbers of remains of ichthyosauri and plesiosauri, while hardly a tooth or vertebra of the mosasauroids was to be found. In America the two former kinds of reptiles appeared to be almost entirely wanting. One or two specimens found here had been alleged to be ichthyosauri or plesiosauri, but farther examination threw strong doubts on the matter. To replace these forms, however, the mosasauroids were found in abundance. The affinities of the mosasauroids were chiefly with the serpents rather than with other reptiles, although they had certain other affinities with swimming reptiles. Prof. Marsh produced some fossil remains of different specimens of mosasauroids, showing the peculiar formation of the skull. These reptiles appeared to have no hind limbs, although Cuvier thought he had detected them. The specimens found in this country, however, afforded no evidence of this. He called attention to two new forms of the family — the *Macrosaurus platyspondylus* and the *Mosasaurus Copeanus* — in which the articulation of the lower jaw was one of the most interesting features. The larger specimens of these animals showed that they must have been the monarchs of the seas of those periods, and in appearance and size not unlike the popular notion of the sea serpent, being sometimes seventy-five feet long.

"On the Flora and Fauna of the Miocene Tertiary Beds of Oregon and Idaho." Prof. Newberry exhibited a beautiful series of fossil plants collected by Rev. Mr. Condon of Dallas City, Oregon. These plants were from the fresh-water deposits which cover so large a surface of the Great Basin in Nevada, Idaho and Oregon, and were of special interest both from their geological position and botanical character. They were contained in the sediments deposited by a series of great fresh-water lakes, which once existed in the area lying between the Rocky Mountains and Sierra Nevada.

In the report of his explorations in California and Oregon, Prof. Newberry had described these lacustrine deposits and had shown how the lakes at the bottom of which they accumulated had disappeared by the cutting down of their outlets, the gorges through which the Columbia, Klamath and Pitt Rivers now flow.

The Klamath lakes, etc., were miniature representatives of these ancient lakes which were apparently quite as extensive as our present great lakes. The fossil plants contained in the collection made by Rev. Mr. Condon were most beautifully preserved, and consisted of a great number of species, most of which were new; but a number were identical with species found in the Miocene Tertiary of the Upper Missouri. There are also some species which had been found in the Miocene beds of Frazer's River and Greenland. The present collection will add much to our knowledge of the Flora of the Miocene period on this continent. The animal remains found in the same series of Tertiaries with the plants, consist of fresh-water shells and fishes, with a few mammalian bones. The shells are numerous species of *Melania*, *Planorbis*, *Corbicula* and *Unio* — all, so far as known, new to science. The fishes were Cyprinoids allied to *Mylopharodon*, etc., — the fishes now inhabiting the Western rivers. Among the mammalian bones contained in this collection were some that plainly belonged to the horse. The beds containing the animal remains were perhaps more recent than the plant beds, but still Tertiary.

Mr. W. H. DALL read a paper "On the Trend of the Rocky Mountain Range, north latitude 60°, and its influence on Faunal Distribution." The paper stated that the Rocky Mountain Range, between latitudes 60° and 64°, bends trending with the Eastern coast, so that instead of there being, as represented on the old maps, a straight line of mountains up to the Arctic Sea, there is an elevated plateau, only broken occasionally by a few ranges of hills. This bend of the mountains prevented the characteristic birds of the west coast from coming north, while a few species of Eastern birds came clear to Behring's Sea, north of it, over the plateau. He also stated that the elevation of the bottom of Behring's Straits one hundred and eighty feet would make dry land between Asia and America, but that a deep ocean valley extended south-west from Plover Bay, just west of the Straits, along the Kamtchatka Coast.

DEDICATION OF THE MUSEUM OF THE PEABODY ACADEMY. — On the eighteenth of August, being the first day of the session of the American Association, the Museum of the Peabody Academy was formally dedicated, and it seemed peculiarly fitting that the exercises should take place in connection with the meeting of the American Association, which adjourned over in order that the members should participate in the proceedings.

At 2 P.M. a number of friends of Science met at the Museum, when a formal transfer of the building was made by the Committee of the Trustees of the original fund, to the Trustees of the Academy, and the charge of the Museum committed to the Director, Mr. F. W. Putnam. The audience then repaired to the Tabernacle Church to listen to the Dedicatory

Address by the President, W. C. Endicott, Esq. Hon. J. H. Clifford replied on the part of Mr. Peabody, the founder of the Academy, who was unfortunately absent from the ceremonies owing to his continued ill health. Remarks were made by Mayor Cogswell; B. H. Silsbee, the President of the East India Marine Society; Henry Wheatland, President of the Institute, and by J. W. Foster, President of the American Association for the Advancement of Science.

ANSWERS TO CORRESPONDENTS.

W. W. B., Indianapolis, Ind.—Your specimens are as follows: 2, *Onoclea sensibilis*; barren frond, common at the north and south. 3, *Pteris aquilina*; widely distributed. 4, *Asplenium thelypteroides*: found north and south. 5, a species of *Galium*. 6, *Eleocharis olivacea* Torrey. 7, no fruit, and not easily determined. If you mean by the "Snow-plant" *Sarcodes sanguinea*, you will not be able to cultivate it, as it is parasitical in its habits and proves very difficult to rear. Herbariums are not usually published unless of rare and costly character, such as of newly discovered species like Fendler's of Venezuela, Wright's of Cuba, etc.—J. L. R.

H., Danversport, Mass.—The worm declared by your patient to have been found in the wound is a worm allied to the common earthworm, and probably lived in the muddy bottom of a well, spring, or brook, and may possibly have occurred in the water used in dressings. We have kept it alive in the bottle in which you brought it, for four or five days.

W. W. B., Indianapolis.—No. 8 is *Botrychium lunaroides* var. *obliquum*; barren frond. Hooker's Synopsis Filicum, and Presl's Pteridigraphia, are essential in studying the ferns extensively.—J. L. R.

W. C. F., Eastham, Mass.—The frog is *Rana sylvatica*.

EXPLANATION OF PLATE 7.

RADIOLARIA.—Fig. 1. Tetrapyle octacantha. Fig. 2. Haliomma amphidiscus. 3. Haliomma longispinum. 4. Haliomma hexacanthum. 5. Haliomma Humboldtii.

BOOKS RECEIVED.

Scientific Opinion. June, July, Aug., Sept. London.

Journal of Travel and Natural History. Vol. i, No. 6. 1869. London. Two shillings.

Proceedings and Transactions of the Nova Scotian Institute of Natural Science at Halifax, N. S. Vol. ii, Part 2. 1867–8. 8vo. Halifax, 1869.

Second Annual Report of the Trustees of the Peabody Museum of American Archæology and Ethnology. Boston, 1869. 8vo., pp. 23.

Pathogenesis of Ptelea trifoliata: a Report to the American Institute of Homœopathy. By E. M. Hale, M. D. Boston, 1869. 8vo, pp. 85.

American Journal of Numismatics. July. New York.

Library of Education, selected from the best writers of all countries. Scottish University Addresses. By J. S. Mill, Jas. Froude, and T. Carlyle. New York: J. W. Schermerhorn & Co. July, 1869. 32mo, pp. 192. 20 cents.

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In our September number, in the "Chapter on Mites," we suggested that Plate 6, fig. 1, represented the larva of *Dermaleichus*, and that fig. 3 represented the male. We were led to this opinion by the resemblance of fig. 1 to fig. 4, the larva of another genus of mites. After the article went to press we obtained the elaborate memoir of Claparede, entitled "*Studien an Acariden*" published in a recent number of Siebold and Kölliker's "Zeitschrift" where he has given a minute account of a neighboring genus, *Myocoptes musculinus* (Koch) found parasitic on mice. After studying Claparede's work we judge that our figure 1 must be a female Dermaleichus, and that fig. 3 represents the male, and fig. 2 the young male.—A. S. P.

On page 368, line 2 from bottom, and on page 373 line 10 from top, for Chelytus *read* Cheyletus. Page 316 line 20 from top, for Euglenia *read* Euglena.

On page 331, line 6 from bottom, for Orange, N. J. *read* Orange, N. Y.

On page 326, line 1 from the bottom, for "Mission County," *read* Mifflin County, Pa. The author of the article on "Table-mountain Pine" (J. T. Rothrock) also states that Mr. Meehan has since found the same pine on the hills near Harrisburg, Pa., and concludes it is native to the whole interior of the State of Pennsylvania. (See Gardener's Monthly, June, 1867, p. 175.)

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